

The Iron Age

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A New Horizontal Molder.

The Egan Co., of Cincinnati, Ohio, are now building an improved 6-inch horizontal molder, shown on this page. The improvements made in this machine will be readily appreciated by those interested in wood-working machinery, and the tool will be found superior in many respects to some of the old-fashioned machines now in use. The frame is cast in one piece, making it very stiff and strong, all of its parts being in accurate proportion for great strength and strain. The bed is gibbed into the frame, and is raised and lowered by a crank, the table being instantly adjusted to any depth down to 16 inches, a point which will be appreciated in working base-boards or very wide lumber, molding, &c., on one edge. The mandrel is of the very best cast steel, and runs in patent self-oiling boxes lined with genuine Babbitt metal. An extra grade of Babbitt metal and steel is used, as the head runs at very high speed and should be lubricated in the most perfect manner. The frame which holds the head is adjusted horizontally across the face of the table, so as to adjust itself exactly to the molding being worked. The head is of steel, slotted on all four sides, and any kind of a bit can be placed on this head. Solid milled bits for any special purpose can be made for the machine, and they will work better and cleaner than any flat bit filed up for that purpose. Solid milled bits are specially recommended where users have special patterns which they want particularly well done. The feed is powerful and is geared in the most improved manner. The rolls are held down with improved springs and can be adjusted to suit the work being done. For carpenters, planing mills, slat manufacturers, trunk-makers, buggy-men, or for any work of that class, the machine is of special advantage and is recommended in the highest manner, as light small moldings of all kinds can be made on it and finely finished. The counter-shaft has tight and loose pulleys 8½ inches in diameter, 4½-inch face, which should run 675 revolutions per minute. Every part of the machine is convenient for adjustment.

Stream Gauging.

Referring to some recent stream gauging for the future water supply of Philadelphia, Mr. H. W. Sanborn, in a paper presented to the Engineers' Club of Philadelphia, described the methods used and why they were adopted. The streams gauged were the Perkiomen Creek and tributaries in Montgomery County, the Neshaminy and tributaries and the Tschickon in Bucks County. The original intention was to gauge the minimum flow only, and for that purpose weirs were constructed on eight different streams. They were very substantially built, as they had to withstand the run of ice in the spring of the year. Heavy bed logs were placed at the level of the bed of the stream and the superstructure built on that. They were made water-tight either by sheeting placed below the bed log to rock bottom or a cement mortar wall. The crests of the weirs were generally about 2 feet above the beds of the streams, and were made of 2-inch oak plank. Gauge-boards were placed about 5 feet above and below the weirs, and connected by levels with the same. The one above indicated the depth of water on the crest. The one below was used only in case the weir was submerged by high water. The weirs varied in length from 15 to 70 feet, according to the width of the stream. The formula used for calculating the flow over the weir was the one by Fteley & Stearns, of the American Society of Civil Engineers. Stream-gauge stations were established near the weirs. Readings were taken there at the same time that they were at the weirs. When a sufficient number of readings at various heights were made, a "curve of flow" was plotted by a comparison of the two. Then, when the crests of the weirs were removed for the winter, the flow was found by referring the stream-gauge readings to the "curve of flow."

The great fluctuation in the flow of the streams, caused by the great number of mills on them, necessitated a great many observations at the weirs to get a correct gauging. This difficulty was overcome by the use of automatic gauges. They were run by clock-work, and drew a line on a roll of paper, corresponding to the rise and fall of the stream. Two descriptions of gauges were used. One was designed chiefly by Mr. Stierle, of the United States Engineers' Office, Philadelphia. The minimum flows were found to be so small that the larger flows had to be determined. These had to be found by other methods, for the weirs would only carry, at the most, 2 feet in depth, while the water in the streams sometimes raised as high as 16 feet. The measurements of the large flows were made mostly by the use of electric-current meters. The measurements had to be made from bridges, and, where none existed in proper places, small suspension bridges were put up. One was built over the Perkiomen, at Frederick, of 120 feet span, and one over the Neshaminy, at Rush Valley, of 133 feet span. By means of the meter the velocity of the water was taken at a great number of places in a line across the stream, and a close estimate of the velocity of the whole cross-section determined. Stream gauges

were placed near the meter stations, to be read when measurements were made, answering the same purpose as those connected with the weirs.

In some cases large flows were measured by getting the velocity of the stream by means of pole floats. When used care was taken to have the length of them as near the depth of the water as possible, and they were run at as many stations across the stream as was necessitated by the changes in the even flow of the stream. The rise and fall of the water during freshets were so sudden, and the stations, 11 in number, were so scattered—the water-sheds covering 500 square miles—that it was impossible to get to and make measurements of more than one or two streams during a freshet. Then, many times, the freshets would come in the night, and nothing could be done but the taking of continuous readings of the stream gauges. To overcome these difficulties and get at least fair measurements of all the streams at the high point of a freshet, "maximum stream gauges" were set up on most of the streams. A place was chosen where the bed of the stream was uniform in width and slope, and two similar gauges set up. They were usually from 200 to 500 feet apart. They were made in the form of a box from 8 to 12 feet long, and 6 inches

170 years, in Silesia; the elm, 130 years, in Silesia; the aspen tree, 219 years. The most frequent among the so-called "historical trees" in Germany are lime trees (linden). The renowned Linden of Neustadt-on-the-Kocher, in Wurtemburg, is known by the local chronicle to have had its branches supported by 67 strong staves in the year 1448, so that it must even then have been a venerable tree. It has now seven horizontal branches, which are supported at from 5 to 7 feet from the ground by stone columns. It is reputed to be over 700 years old, but it can hardly be said to be alive; it is quite hollow, and is supported internally as well as externally.

Carbonic Acid in the Liquid and the Solid State.

The employment of liquefied carbonic-acid gas for various manufacturing operations has resulted in the development of a new industry. For many years after Davy and Faraday had succeeded in effecting the liquefaction of this gas, and even after Natterer, of Vienna, had devised a special apparatus for the purpose, the process was regarded merely in the light of a lecture experiment, and was only usefully employed for the production of very low temperatures. Attention was first directed to the

into the beer casks, all putrefactive processes are avoided and the beer is drawn in a bright and sparkling condition. Eight kg. of the compressed gas are sufficient for the delivery of 24 to 30 hl. of beer.

The pressure exerted by liquid carbonic acid varies in accordance with the temperature, thus:

Atmosphere.
At -79° C. the pressure = 1.9
At -10° C. the pressure = 27.5
At +5° C. the pressure = 40.5
At +20° C. the pressure = 58.8
At +30° C. the pressure = 73.0

All danger in the storage of the compressed gas is avoided by the testing of the cylinders (which are made of wrought iron) to 250 atmospheres before they are filled, and the receivers are furnished with a safety-valve, weighted to a little over 1½ atmospheres pressure, and these are all tested to five atmospheres. Although between 6000 and 7000 cylinders of the liquefied gas have been sent out and have been used for the most part by unskilled persons, there have been no accidents of any kind. The price of a cylinder of the liquid is 10 marks. By removing the pressure or allowing the liquefied gas to escape into a woolen bag an intense cold is produced and a sufficient amount of heat is abstracted to cause a portion of the remaining liquid to freeze

portion of the recognition of the flow of metals in science, in art, and in industry was then referred to, and some observations by Mr. Baker, the engineer of the Forth Bridge, were alluded to as showing the import and beneficial effect of compression on the mechanical properties of steel destined to be used for certain purposes. Professor Roberts-Austen concluded by showing that as regards absorption of gas, diffusion, vaporization and surface tension, solid metals present close analogies to fluids.

Expansion Produced by Amalgamation.

At a recent meeting of the Physical Society a paper on "The Expansion Produced by Amalgamation," by Professors Aytron and Perry, was read. It had been accidentally observed by the authors that the amalgamation of brass is accompanied by great expansive force. If one edge of a straight, thick brass bar be amalgamated it will be found that in a short time the bar is curved, the amalgamated edge being always convex and the opposite concave. The authors imagine that a similar action may be the primary cause of the phenomena presented by the Japanese "magic mirrors." Japanese mirrors are made of bronze and have a pattern cast upon the back, and although to the eye no trace of it can be discovered upon the polished reflecting surface, yet when light is reflected by certain of these mirrors on to a screen the pattern is distinctly visible in the luminous patch formed. In a paper read before the Royal Society they have shown that this is due to the polished side opposite the thinner parts of the casting being more convex than the others, a conclusion verified by the fact that the pattern is reversed when formed by a convergent beam of light. Such a condition of things would evidently result from a uniform expansive stress taking place over the reflecting surface, the thinner and consequently the weaker parts becoming more convex or less concave than the others. The authors have hitherto attributed this inequality of curvature to a mechanical distortion to which the mirrors are intentionally submitted during manufacture to produce the general convexity of the polished surface, but they now think it possible that the use of a mercury amalgam in the process of polishing may have an effect in the production of this inequality of curvature.

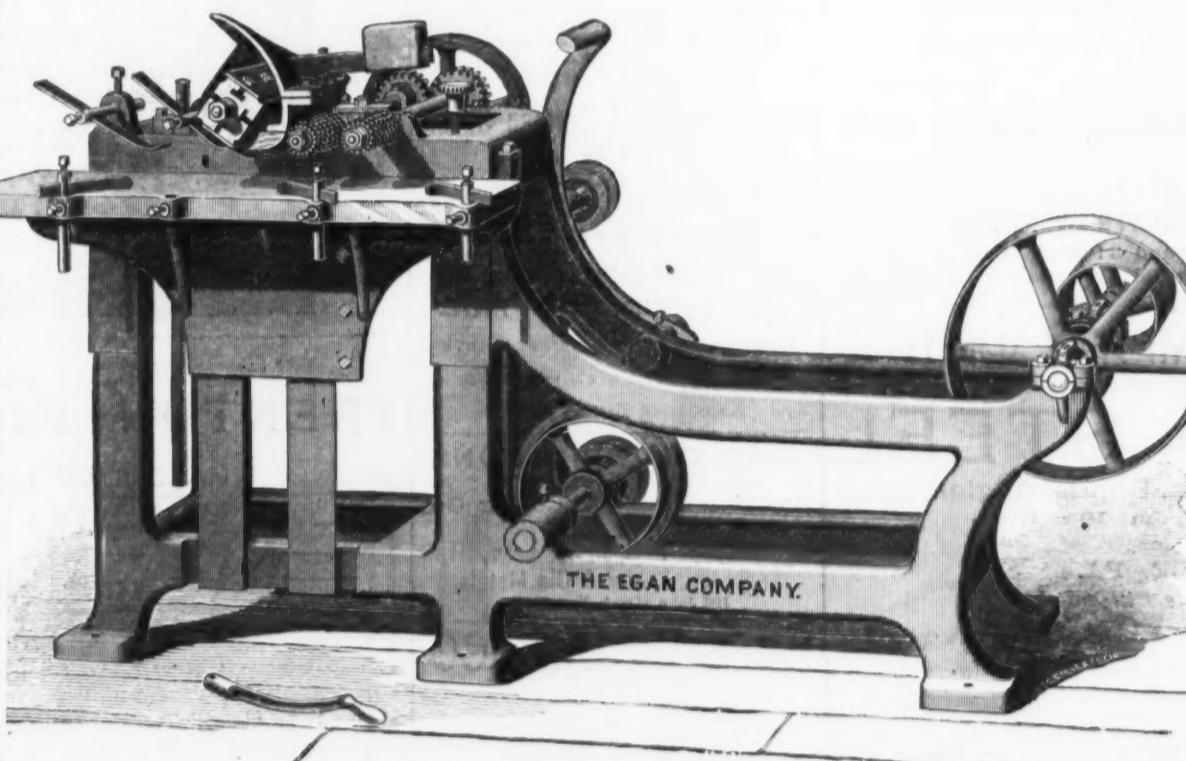
The Brake Question in France.

The French Government has not been slow to take the necessary steps with reference to the brake question and the Monte Carlo disaster. The debate in the Chamber has had the effect of stimulating the Government to take further measures for increasing safety in railway-working. The following circular has been issued by the Minister of Public Works and forwarded to all the French railway companies:

"Gentlemen: In accordance with the opinion of the commission instituted in 1879 for the purpose of investigating the means of preventing railway accidents, a ministerial circular of September 13, 1880, prescribed, among other measures, 'the fitting up with continuous brakes of all passenger trains which at their highest speed reach 60 km. (37½ miles) per hour, and, in addition to this, the continuance of the counter-pressure system.'

"If the administration in the first instance thus limited the use of these brakes, it was solely, as mentioned in another circular of 23 January, 1880, with the object of not forcing the companies to face in too short a time the considerable expenses which would have been required for the immediate equipment of all their express trains. But at this moment the installations prescribed by the circular of 1880 have been completed, and since all vehicles forming fast and express trains are fitted with continuous brakes, the moment appears to me to have arrived when the application of this appliance should be extended to all vehicles forming part of passenger trains. I have therefore begged you to undertake the application of continuous brakes to all passenger carriages, and all other vehicles run in express trains, such as luggage vans, mail vans, horse boxes, carriage trucks, milk wagons, fish trucks and fruit trucks, &c.; and, to carry on this work with the necessary expedition, to insure that after a period of two years at the furthest all passenger trains, including therein also omnibus trains, are provided with continuous brakes. I beg you also, in the same period, to fit continuous brakes, and the counter-pressure apparatus, on all engines intended for the service of these trains."

Merlett, at Stiabau, Austria, gives the following as an excellent method for restoring burnt tool steel, which, he says, has been tested many times: Melt in a crucible three parts by weight of pure colophonium, and, slowly stirring, add two parts by weight of good boiled linseed oil. Particular care must be taken in doing this, because at a high temperature the mixture is easily ignited. Finally, a dark-brown mass of the consistency of syrup is obtained, which, after cooling, is kept near the smith's fire, in a closed pot, for use. Any piece of steel, however burnt, dipped red-hot into the liquid is restored to its original quality, and if the operation is repeated is even improved. The steel is hardened best at a dark-red heat in rain water.



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square inside. One side opened as a door. They were placed on end and shielded and supported by heavy timbers imbedded in the soil or hoisted to the rock bottom. Vertically through the center of the box ran a brass rod, which was graduated. A metallic float ran on the rod in such a manner that it would rise with the water, but would remain fixed on the rod at the highest point the water reached after it had fallen. The two gauges were connected by levels, and from the gauge readings the slope of the water was determined. From this the velocity of the stream was found by the Kutter formula. Three automatic rain gauges were used to show the intensity of the storms.

SCIENTIFIC AND TECHNICAL.

The Age of Trees.

The Prussian Chief Forester Gericke, in a recent number of the *Forstliche Blätter*, declares it to be a fable that there are trees in the German forests which have lived for a thousand years. Even the so-called "historical trees," he says, to which an age of 700 to 800 years is imputed, are nothing but "hollows surrounded with bark, vegetating only as ruins." No tree can reach so great an age in Central Europe and remain healthy. He has been at the pains to make inquiries at all the German, Austrian and Russian forest academies; and, comparing their reports with his own long researches, he has compiled a table of the comparative ages of the different sorts of trees in Central Europe. The highest age is attained by the pine; but after it has reached the limit of sound life it declines more rapidly than any of the leaf trees, which continue vegetation long after they have begun to decay. The oldest pine tree, judging by its annual rings, reaches an age of 570 years. The next in age, the white fir of the Bohmerwald, is 420 years old. The larch, in Bavaria, was at its oldest in 274 years. The oldest sound oak, which is at Aschaffenburg, is 410 years of age. The oldest red beech, also at Aschaffenburg, is 245. The highest point of healthy age with other leaf trees is as follows: The mountain maple, in Bavaria, 224 years; the birch, 160 to 200 years, in Finland; the ash,

subject in connection with the plans for raising the armor-clad ship, the Grosser Kurfürst in 1878. The first practical experiment in this direction was carried out at Kiel in 1879, when, by means of about 40 kg. of liquid carbonic acid inclosed in a receiver, to which was attached an empty balloon formed of sail-cloth coated with India-rubber, a block of stone weighing 316 centners (16 tons) was raised to the surface in eight minutes after the tap opening the communication from the receiver to the balloon was turned by a diver. The success of this experiment led to the proposal to found a company for the raising of sunken vessels on this system, but the scheme came to nothing, partly because of the difficulty at that time of producing the liquid in large quantities at a cheap rate.

Subsequently, Mr. F. A. Krupp, of Essen, used this fluid for the production of low temperatures for shrinking out the cores of cannons and for the compression of molten metal in the molds. He obtained in this way a pressure of 75 atmospheres, and was able to produce much more solid and dense castings than before. In consequence of the steady improvement in the pumping apparatus employed at Essen for the compression of the gas, and the production of the liquid in large quantities, it became possible, owing to its cheapness, to make use of it for raising and in the manufacture of artificial mineral waters. In the course of time the firm of Kunheim & Co., of Berlin, took the matter in hand and turned the scientific facts to industrial account. Their business was taken over by the Berlin Co., for the carbonic-acid manufacture, which has been most successful, and now produces daily 80 cylinders, each containing 8 kg. or 640 kg. (1412 pounds) of liquid carbonic acid, equal to 320,000 liters of gas. This is employed for beer raising in the same way as compressed air was formerly made use of. The cylinder of liquid is attached to a receiver, and on turning the tap connecting the two vessels the liquid rushes in, and expands in so doing into the gaseous form. In a few seconds this gas attains a pressure in the larger vessel of 1½ atmospheres, and the tap is then closed. The pipes conducting to the beer casks are subsequently opened, and the carbonic-acid gas flows into the casks with a pressure sufficient for the drawing off of the beer. As only pure carbonic-acid gas passes

into crystals, resembling snow. These frozen needles can be brought, by means of slight pressure, into solid lumps resembling chalks, which are specifically heavier than water, and which by increased pressure can be obtained of a specific gravity of 1.5. By surrounding this solidified carbonic acid with a bad conductor it may be preserved for as much as 15 hours, during which time it is, of course, being gradually dispersed in the gaseous form.

Metals, Fluid and Solid.

Prof. Chandler Roberts-Austen, F.R.S., recently delivered a discourse at the Royal Institution, London, England, on "Certain Properties Common to Fluids and Solid Metals." He pointed out that, although the characteristics of solid metals and of fluids appear at first sight to be widely different, there is much experimental evidence showing that under certain conditions solid metals behave like fluids. The phenomena attending the passage of metals from the fluid to the solid state were first dealt with, and the beautiful experiment of Van Riemsdijk, showing that pure gold on freezing behaved like water—that is, it may be cooled below its solidifying point without becoming solid. When, however, by agitation, the metal sets, it becomes brilliantly luminous owing to the liberation of the latent heat of fusion. Passing to solid metals, Professor Roberts-Austen referred to a forgotten experiment made by Louis Lemery in 1726, showing that lead when cast in a peculiar form is sharply sonorous, and he alluded to Réaumur's experiments on this subject, which proved that hammering on the transfer of matter from one position to another by flow alters the shape of the grains and the way in which they touch one another, and leaves them, in the hammered lead, no longer free to vibrate. The results obtained by the late M. Tresca on the flow of solid metals were then fully dealt with, and the lecturer passed to the elaborate investigations of Professor W. Spring, of Liège, on the compression of finely-divided metals into solid blocks. He repeated many of M. Spring's experiments, obtaining crystalline bismuth under a pressure of 6000 atmospheres, and building up the alloy fusible metal, which fused at 100° C. from the powders of its constituent metals, which have much higher melting points. The im-

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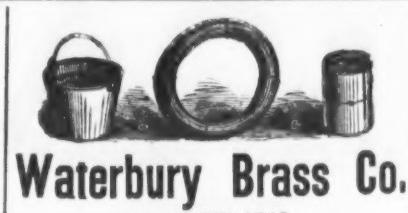
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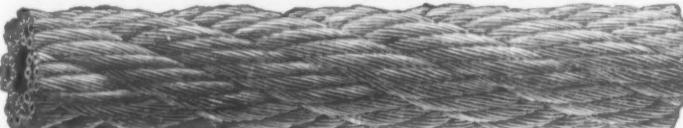
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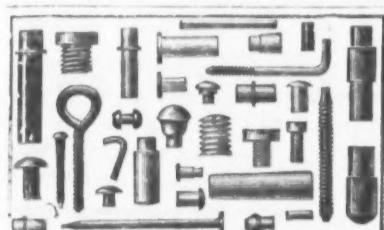
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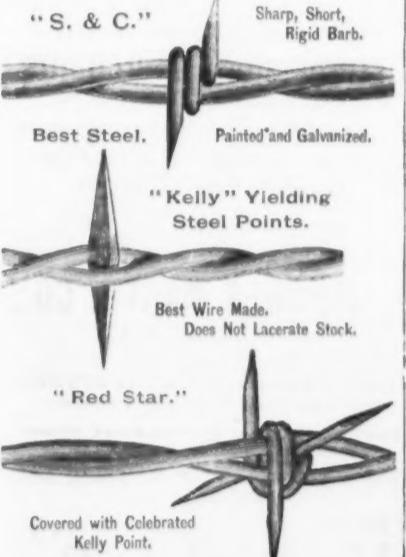
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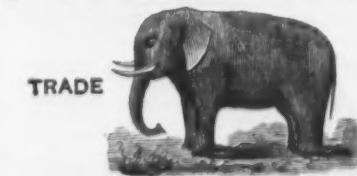
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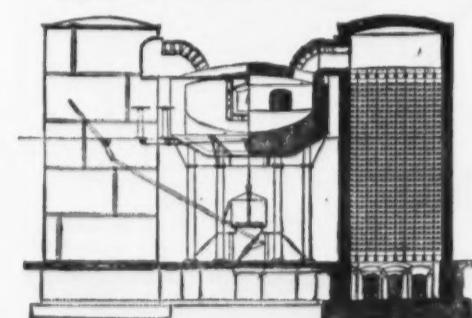
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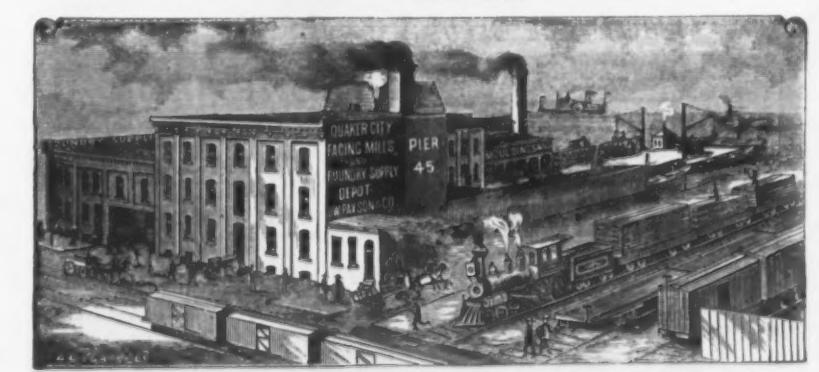
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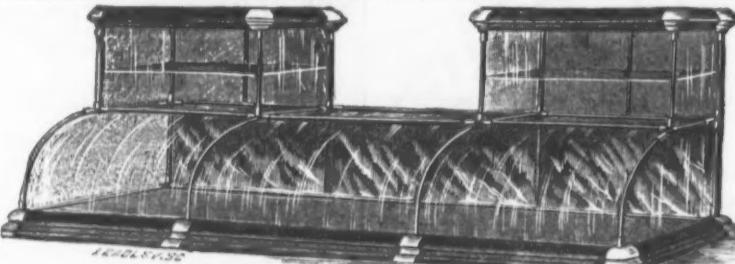
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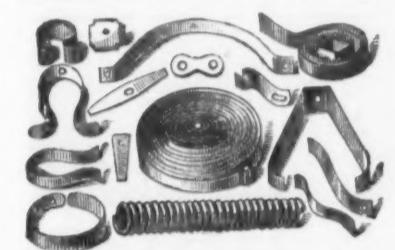
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Fig. 120.



Fig. 365.

Fig. 209.



Fig. 70.



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conditions; it was held to be inferred that the goods were to be shipped under the same terms as usual.

Although the owner or shipper is bound by the conditions if he accepts the bill of lading, he is under no obligation to receive it. He is at liberty to protest against any or all of the conditions. He has the right to demand a simple bill of lading without restrictions. He can compel the company to take and transmit his goods and to give him such a bill. The carrier is under a legal obligation to accede to this demand, and is liable to an action for damages in the case of refusal. This is because it is a public or common carrier. But, although this is the undoubted legal right of the shipper, it is a right which in practice he is not in a position to assert. The company force their bill on the shipper. He must either take that or nothing. It is true he may sue the company in the courts, but this is a tedious and expensive proceeding. He can compel the company to take and transmit his goods and to give him such a bill. The carrier is under a legal obligation to accede to this demand, and is liable to an action for damages in the case of refusal. This is because it is a public or common carrier. But, although this is the undoubted legal right of the shipper, it is a right which in practice he is not in a position to assert. The company force their bill on the shipper. He must either take that or nothing. It is true he may sue the company in the courts, but this is a tedious and expensive proceeding.

Some of these conditions or exceptions from liability are, as has been said, just and reasonable—such as the condition which requires the shipper to state the value of packages containing money and jewels. But others are regarded by the mercantile community with great disfavor, particularly that condition which makes the carrier not responsible for the negligence of his employees. This effect of this exception is to wipe out the last vestige of liability on the part of the carrier. It leaves the company free to act as it pleases in regard to the goods intrusted to its care, knowing that it cannot be held responsible.

It is an evasion of one of the most just and salutary rules of law—i.e., that the employer should be liable for the acts of his servants. And a corporation acts through its employees exclusively. The question arises—is such a provision in a bill of lading valid and binding on the shipper? Or is it against public policy, and void in spite of the contract? This question has been discussed in the courts in many important cases, some courts deciding one way and some holding a directly opposite opinion. It is argued in behalf of the companies that rates of freights have been made low in expectation that the shipper would agree to accept the bill of lading offered him. If they are to assume such heavy risks the rates must necessarily be raised, and it is for the interest of the shipper, all things considered, to have low rates under the usual bill rather than high rates and a bill without exception from liability. Moreover, it is claimed that the shipper can always protect himself by insuring his goods in some insurance company at small expense, and that it is hardly fair to permit the insurance companies to receive these premiums and then come back on the railroad or shipping company for indemnity. There is considerable weight in this view, particularly in this latter argument, for under the state of facts indicated the question is not between the shipper and the carrier, but between the carrier and the insurance company, as to which shall bear the loss. The shipper is perfectly protected, having two parties to look to for compensation. And if the carrier is to be held liable for the loss the insurance company which pays the amount in the first instance to the shipper has the legal right to recover that amount from the carrier company.

On the other hand it is argued that to allow the carrier to stipulate for exemption from liability for his own negligence or that of his employees is to put a premium on carelessness and take away the strong incentive the carrier would otherwise have to properly guard and care for the goods of the shipper. It is regarded as against public policy to permit such immunity. As to the argument in regard to insurance, it may be replied that that is a contract entirely outside of, and having nothing to do with, the contract of the shipper and the carrier. The shipper is under no obligation to insure his goods, and the carrier has the right, if he so desires, to protect himself by insuring his own risk. This is the view of the Supreme Court of the United States in the celebrated case of Lockwood against the New York Central Railroad Co., decided in 1873. It is there held that an exception in the bill of lading exempting the carrier from liability for loss occasioned by negligence is void, although agreed to, and the shipper may, notwithstanding, recover from the company. In New York the Court of Appeals holds the contrary view, and if there is such a provision the shipper cannot recover.

In view of the divergence of legal and judicial opinion on this subject, and to protect more particularly Transatlantic shippers, the New York Chamber of Commerce have endeavored to secure international action on the subject, so as to remove such objectionable features of the present practice as may exist. The bill before Congress at the present time, and which has recently led to so much discussion both here and elsewhere, was drafted largely in accordance with the views expressed in the report of the committee appointed by the Chamber to investigate the subject. This bill provides that it shall not be lawful for vessels or their owners to insert in any bill of lading the exception as to negligence, and, if inserted, it shall be void and of no effect in law. It would certainly seem that this bill should become a law, although there is no doubt that it will be bitterly opposed by the shipping companies, most of them English corporations, who control the bulk of the carrying trade to and from our ports.

It is reported that considerable quantities of manganese ore are being exported from Chili.

San Francisco seeks to secure for itself the reputation of being a leading market in the tea trade by introducing a series of

monthly sales at auction. During the new season of 1886-87 about 10,000 chests will be sold, at the rate of 1000 chests a month, beginning in July. San Francisco is within 15 days' steam of Yokohama, the great tea entrepot of Japan, and within 10 days' or less of Hongkong.

Burmese Arms.

Long matchlocks, with very small stocks, are the only Burmese firearms besides the short, broad cannon used in salutes. The former carry a long distance, and are not fired from the shoulder, but from the side of the head, nearly on a level with the ear. Attached to the small square embroidered bag that every Shan carries over his shoulder is a small powder-flask of the shape of a miniature horn, flattened and distended at the point, which is open, but has a flat piece of horn which fits into it, and is prolonged backward across the curve of the flask, to the base of which it is firmly fastened. Downward pressure on the free portion over the curve raises the lid-like anterior extremity of this primitive spring and allows the powder to run out in driplets. More capacious powder-flasks are made of the horns of cattle, but they are only used on a long expedition. They are suspended from a broad red belt ornamented with lines and rosettes of cowries, and with tufts of red hair round the margins. The horn of the serow, artificially sharpened at the point, is usually found attached to the shoulder-bag, and is used as a horser, while its base may be bound with brass and closed with a lid, as a lime or opium box.

A description of the costume of the Shans generally would be very incomplete were the *dah* unnoticed. This has a blade 2½ to 3 feet long, gradually expanding from the hilt toward the almost square point, which is about 2½ inches broad. The handle is of wood, bound with cord and ornamented with silver foil, with a tuft of red goat's hair stuck in the hilt. The wooden scabbard covers only one side of the blade, and a hoop of rattan, bound with red cloth, is attached to its upper third and worn over the right shoulder. The Kakhyens have a very ingenious way of striking fire by the sudden and forcible descent of a piston in a closed cylinder. There is a small cup-shaped cavity at the end of the piston-rod into which tinder is inserted. The piston is then introduced into the cylinder, which it tightly fits, and by a blow is made to descend with great rapidity and force, and is as rapidly withdrawn, when the little pellet of tinder is found to have become ignited—beautiful but simple experiment, illustrating the evolution of a very large amount of heat by the sudden compression of the air in the piston. These instruments are not more than 4 inches long and are in general use.

A Miner's Inch of Water.

Concerning the history which involves the present definition of the term, "a miner's inch," Prof. Henry G. Hanks, State Mineralogist of California, remarked some time ago:

The term, "a miner's inch of water," is of California origin, having grown out of the method of measurement here adopted by the ditch companies in disposing of water to their customers. "A miner's inch of water" varies in different localities to such an extent that it may almost be said to constitute an arbitrary quantity. This arose from the practice that obtained in the early days, whereby each ditch company having water to sell, fixed the quantity to be represented according to such standard as best suited itself, and which, coming to be generally recognized, grew at last into a custom having the force of law in that locality. Hence the disparity in this respect that prevails throughout the mining districts of the State. In the delivery of water the varying elements consist of the head or pressure and the size of the aperture. The "miner's inch" that has come to be most widely accepted is the quantity of water that will flow from an orifice 1 inch square through a 2-inch plank, with still water standing at a depth of 6 inches above the top of the orifice. Through a plank so perforated 2274 cubic feet of water will escape in 24 hours—say 17,000 gallons. Where this method of measurement is adopted a long horizontal slit, 1 inch high, is made in the discharge-box, a slide being used to regulate the number of inches which it is intended shall escape. This being a simple and convenient arrangement for determining the quantity of water delivered, accounts, in part, for its popularity. At Smartsville an opening 250 inches long and 4 inches wide was used for measuring the water delivered under a pressure of 7 inches above the top of the opening, the discharge so effected being 1000 "Smartsville" inches. This flow is equal to 1 $\frac{1}{2}$ cubic feet per minute—2534 $\frac{1}{2}$ cubic feet, or, say, 19,000 gallons, in 24 hours. The South Yuba Canal Co. discharge water through a 2-inch aperture in a 1 $\frac{1}{2}$ -inch plank, under a pressure of 6 inches measured from the center of the aperture, while the North Bloomfield, the Milton and the La Grange companies calculate the inch by a flow through an opening in a 3-inch plank, 50 inches long and 2 inches wide, the water standing 7 inches above the center of the opening. The Eureka Lake and Canal Co. adopt an orifice 2 inches high, under a pressure of 6 inches; if this orifice be 10 inches long, 20 inches of water escape. In some cases the water is delivered under a pressure of not more than 3 or 4 inches, and occasionally without any pressure at all.

A series of experiments were made by A. J. Bowie, Jr., C. and M. E., to determine the effective value of the "miner's inch," under the following conditions: Water discharged through a rectangular aperture 50 inches long and 2 inches wide, in a 2-inch plank, and under a pressure of 7 inches above the center of the opening. Result approximately: 1 miner's inch discharged in 1 minute, equivalent to 1.50 cubic feet, equal to 12 gallons; 1 miner's inch discharged in one hour, equivalent to 90 cubic feet, equal to 700 gallons; 1 miner's inch discharged in 24 hours, equivalent to 2160 cubic feet, equal to 17,000 gallons.



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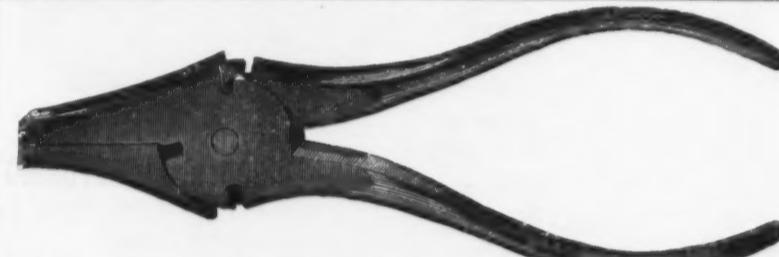


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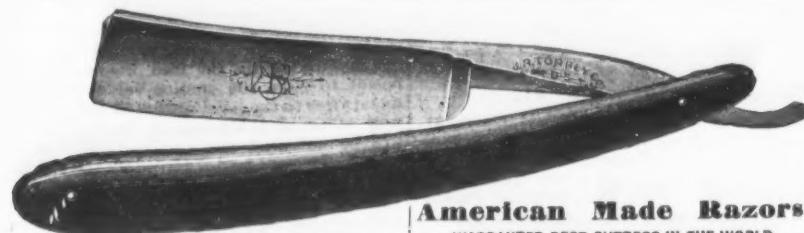
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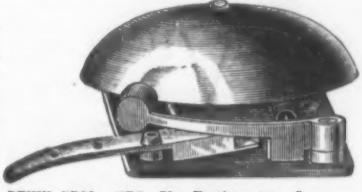
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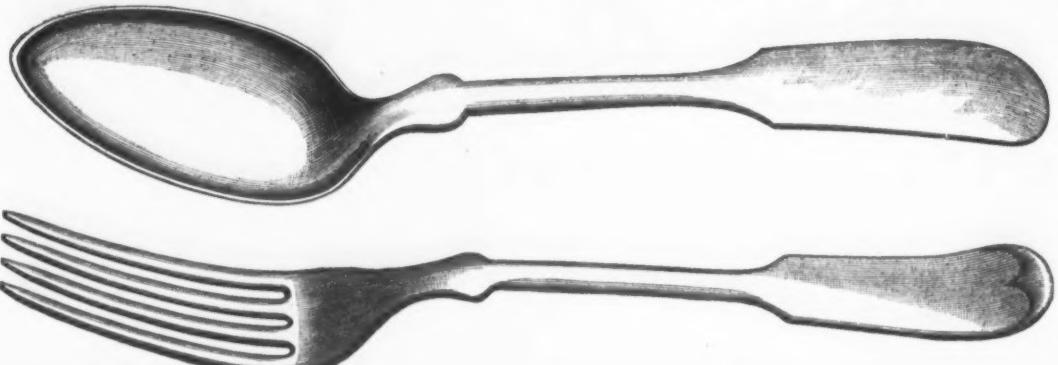
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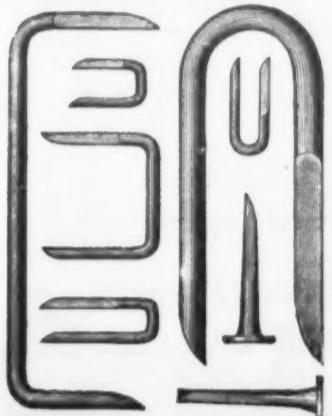


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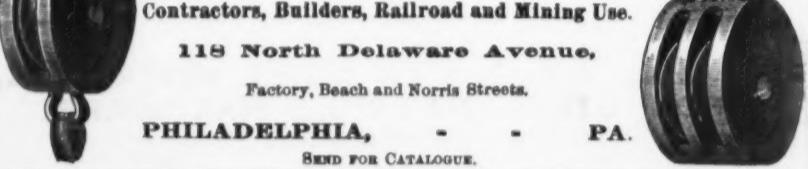
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Every pair is positively warranted not to come loose or give out in any way.

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Price Lists furnished on Application.

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BOSTON: 224 FRANKLIN STREET.PHILADELPHIA: 15 N. SIXTH STREET.
CHICAGO: 25 WASHINGTON STREET.Comparative Value of Different Kinds
of Wood and Coal for Fuel.

The last issue of the *Locomotive* gives the following table showing the weight of one cord of various kinds of wood, dry, and their relative values for fuel, red oak being taken as the standard:

Kind of wood	cord in pounds.	Relative value for fuel.
Red oak	3,354	1.00
Shell-bark hickory	4,469	1.45
Chestnut white oak	3,955	1.25
White oak	3,821	1.17
White ash	3,450	1.12
White beech	3,296	0.94
Black walnut	3,044	0.94
Birch black	3,115	0.91
Yellow birch	3,019	0.97
Hard maple	2,878	0.87
White elm	2,592	0.84
Large magnolia	2,704	0.81
Soft maple	2,668	0.78
Soft yellow pine	2,463	0.78
Sycamore	2,391	0.75
Chestnut	2,333	0.75
White urch	2,369	0.70
Joe pye pine	2,157	0.70
Pitch pine	1,904	0.68
White pine	1,868	0.61

The values given above are from Knapp's "Chemical Technology."

The following table, useful in connection with the preceding one, is reproduced from the *Locomotive* of May, 1883. It shows the value of different coals for fuel purposes, the comparison being made with oak wood as the standard:

Designation of coal.	Mine, where located.
1 semi-bituminous, Standard Coal Co.	Brothers Valley, Somerset Co., Pa.
2 semi-bituminous, Philson Iron Coal Co.	Berlin, Somerset Co., Pa.
3 Forest Improvement anthracite	Richardson colliery, Schuykill Co., Pa.
4 Wilkesbarre anthracite	Wilkesbarre, Northumberland Co., Pa.
5 Scranton anthracite, H. Canal Co.	Luzerne Co., Pa.
6 Lykens Valley anthracite	Lykens Valley, Dauphin Co., Pa.
7 Hazelton, Horner & Sons.	Dauphin Co., Pa.
8 Los Cerrillos anthracite.	Monongahela River, Pa.
9 Scranton anthracite, D. L. & W. R. R. Co.	Ortez grant, New Mexico.
10 Bituminous coal, T. Fawcett & Sons.	Luverne, Pa.
11 West Virginia splint.	Neal Pittsburgh, Pa.
12 Free-burning medium hard.	Ortez grant, New Mexico.
13 McAllister coal.	Raven Run mine.
14 Scotch splint (Duke of Hamilton).	Tobosky Co., Choctaw Nation, Ind. Ter.
15 Scotch coal.	West Hartley district.
16 South Wellington coal.	S. Wellington col'y. Departure Bay, V. I.
17 South Wellington coal.	Cowpen colliery, Newcastle-upon-Tyne.
18 Cowpen, West Hartley.	La Plata mine, near Fort Lewis, Col.
19 Indiana cannel coal.	Davies Co., Ind.
20 Indiana cannel coal.	Chase River, Nanaimo, Vancouver Island.
21 Nanaimo coal.	West Hartley district.
22 Cowpen Cambios, West Hartley.	West Hartley district.
23 Wellington coal.	Wellington mine, Departure Bay, V. I.
24 Bituminous Leavenworth coal.	Leavenworth coal shaft, Leaven, Kan.
25 Bituminous carbon coal.	Cowpen Cambios, Co., Col.
26 Bituminous coal.	Chestnut mine, Rock Creek Cañon, Mont.
27 Rocky Mountain coal.	Rock Spring mine, Nebraska.
28 Eastport, Coos Bay coal.	Mine at the head of Coos Bay, Oregon.
29 Pittsburgh coal.	Pittsburgh Mount Diablo mine, Somerville, Contra Costa Co., Cal.
30 Weber coal.	Chalk Creek, Summit Co., Utah.
31 Lignite coal	Military Reserva., Fort Stevenson, Dak.

Lbs. water evaporated from atmos. press. and of coal per cord of stand- ard oak.
88.90 9.85 1.521
90.99 9.75 1.537
79.48 9.37 1.598
80.77 9.37 1.598
82.58 9.38 1.614
88.97 9.07 1.621
92.15 9.07 1.633
88.25 9.04 1.657
88.85 8.87 1.687
94.04 8.78 1.706
86.74 8.60 1.742
91.90 8.34 1.796
81.20 8.24 1.818
94.20 7.68 1.950
93.28 7.61 1.970
93.00 7.59 1.970
91.83 7.59 1.974
93.89 7.52 1.993
80.10 7.49 2.000
75.18 7.32 2.040
93.79 7.04 2.129
90.62 6.71 2.238
88.91 6.49 2.307
90.45 6.45 2.328
90.57 6.07 2.466
93.50 6.12 2.491
91.16 5.34 2.839
89.16 5.05 2.955
89.98 4.73 3.168
93.77 4.08 3.712

The two tables enable a comparison of the comparative values of any wood and coal to be made. The latter table is from a report on fuel for the army, by Quartermaster-General M. C. Meigs. The value of wood as a fuel depends greatly on its dryness. After two years of natural seasoning it may contain from 20 to 30 per cent. of water, the amount of seasoning depending greatly on the condition of the wood, whether sawed, split or left in its natural state. The calorific power for equal weights of all woods is substantially the same, being about 7200 thermal units for 1 pound of dry wood, and 6400 units when it contains 20 per cent. of water.

English Letter.

(From Our Regular Correspondent.)

LONDON, April 26, 1886.

THE OUTLOOK
has not brightened to any extent since I last wrote on your behalf, especially as the Easter holidays are in full force at date. Favoured as we are by most magnificent weather, the holidays are pretty certain to "make a hole" in this week, as they did in last week; consequently, the effects of the brilliant sunshine will not be felt until toward the end of the week. That such a burst of sunshine will benefit many branches of trade is a "moral certainty" which needs no demonstration. We poor Britshers are sun worshippers to the extent that when that bright luminary makes his unclouded appearance our spirits rise rapidly and we are more disposed to "enterprises of great pith and moment" than when the sky is covered with a mantle of leaden hue and apparently of leaden weight. After the long winter we appreciate the change all the more, and welcome our old friend Sol with open arms. Should the weather continue fine I think the improvement which is usually observed in May may be somewhat accentuated. The advices received from your side by mail and cable do not yield the encouragement and support so confidently built upon by the more sanguine among us a few months ago. Until your reports are couched in more cheery tones I do not think we shall be able to note any material movement here, and even then I am disposed to doubt whether we shall be in a position to record anything like a notable change for the better.

The restriction plan put forward by the British Iron Trade Association is still the subject of a good deal of talk in iron-making circles. What the result of the canvass of the smelters may prove to be is as yet unknown, but it assists one in prognosticating the result to pursue a return got out by your contemporary, the *Ironmonger*. That journal says that it has circularized all the ironmasters in order to ascertain their views on the restriction scheme. A number of them have replied, although the majority seem to prefer "sitting on the fence" in order to see "how the cat jumps" before committing themselves. The general tone of the replies seems to be that restriction is believed to be the only available remedy, but that nobody exactly knows how it is to be carried out successfully. Some of the smelters advocate "the natural remedy" or "the survival of

the fittest" as the alternative course, while many of them fear that if restriction were successful in raising prices the result might be the loss of some of our foreign trade. On the whole I expect we shall see that the restriction plan will fall through. Many of the smelters are opposed to it on principle, others accept the principle, but will not adopt it themselves. Still others cannot limit their make either by reason of their running contracts or because their royalties are so arranged as to compel them to maintain a maximum rate of production.

Among the witnesses examined by the Royal Commission on the Depression of Trade is Sir I. Lowthian Bell, whose evidence is most voluminous, as was to have been expected. Sir I. L. Bell instructed the commission on various points, ranging from percentages of phosphorus downward, and, generally speaking, had matters so much his own way that his evidence fills about 70 pages of the Blue Book. He said, among other things, that he anticipated the gradual but sure replacement of iron by steel; that Great Britain was always bound to be a foremost iron-making country, and that we could probably produce iron more cheaply than elsewhere, except, perhaps, your Southern States. He termed the Thomas-Gilchrist invention the "so-called" basic process, but spoke highly of its future, and gave some interesting evidence as to its working in Great Britain and in Germany,

1837.



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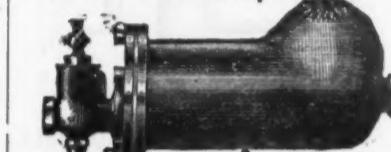
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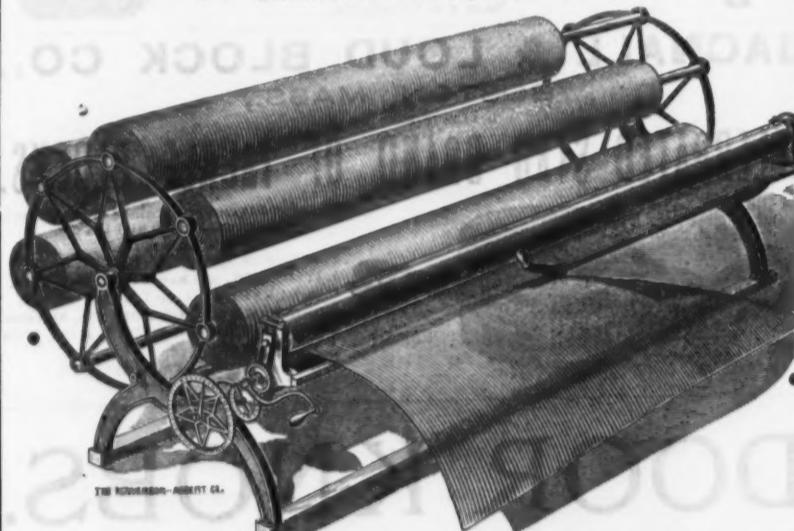
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The Revolving Head carries Seven Rolls of goods at one time, and is long enough to take in the 45-inch width of green wire. Its construction is first-class; operation simple; measurement accurate, from a fraction of an inch to 5 feet; cutting complete, and it is ornamentally painted.

Since the introduction of Green Wire for screens the dealer has had an untold amount of bother and waste of time in handling the goods, besides a waste in remnant, while this Machine will save, by accurate measurement, enough in one season to pay for all remnants unsaleable. As a labor and time saving machine it will pay for itself each year.

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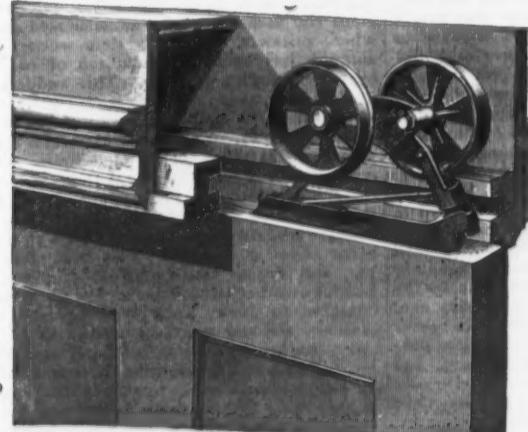
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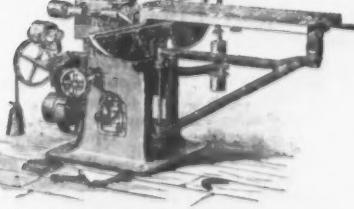
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probable a week or two since now seems hardly possible. Meantime the bond file inquiries amount to about 30,000 tons, the chief items being 12,500 tons for the Queen's Land Government, 6,000 tons for the East India Railway Co., 4,300 tons for the Bombay, Baroda and Central India Railway Co., 2,300 tons for the Great Southern and Western of Ireland, and 2,000 tons for the Colne Valley Railway Co.

SCOTCH PIG IRON

The Scotch market has been closed for some days, owing to the holidays, but its tone prior to the stoppage was not very strong, and not more than a medium amount of business was transacted. There are now 97 furnaces in blast in Scotland, against 90 a year ago. In Connal's stores the stock is 734,713 tons (an addition of 441 tons last week), as against 594,701 tons the same date in 1885. Shipments to date are 31,807 tons in arrears, while Middlesbrough pig iron imports are 20,708 tons. Current quotations:

Deliverable alongside.	No. 1.	No. 3.
Gartsherrie, at Glasgow	43	41
Coltness,	47	45
Linton,	44	42
Sunderlee,	40	41
Caider,	40	41
Carnbroe,	43	41
Clyde,	43	40
Monkland,	39	36
Quarter,	38	36
Govan, at Broxburn,	39	36
Shotts, at Leith,	45	41
Caron, at Grangemouth	48	45
Kinnel, at Bo'ness	45	42
Glenegarock, at Ardrossan	40	40
Eglinton,	39	36
Dalmellington,	41	38

MIDDLESBOROUGH FIG IRON

remains very quiet, notwithstanding that the production has been somewhat interfered with during the rearrangement of wages. For G. M. B., f.o.b. at makers' wharves in the Tees, net cash prices, are as under:

No. 1 Foundry.	22/9	Mottled.	29/
2 "	31/9	White	28/9
3 "	29/9 @ 30/3	Refined metal	47/
4 "	29/9	Kentledge	35/6
4 Forge	29/9	Cinder	30/

THE ROYAL COMMISSION

on the Depression of Trade has been the means of eliciting a good deal of useful information on a variety of subjects. The second report has just been issued and forms a very bulky volume. It is much too long for me to give you even a short précis of its contents, but I fancy you will be able to pick out sundry very interesting "bits" from it, or from the extracts published by the English papers.

TIN PLATES.

In London this market is steady and without special feature. Most of the works appear to be fairly well off for orders, and although American buyers are not very active they have been placing a fair number of contracts. I quote ordinary 1C cokes, 13/3 @ 13/6, f.o.b. Liverpool. At Liverpool the tin-plate market continues fairly steady. With the collapse of the combination to reduce the make speculation seems to have ceased. The quantity of plates made is so large that no individual maker is able, as in the good old days, to control the market. Inquiries have been numerous this week, but for the most part they are for steels of various qualities and grades. Persistent efforts are still being made to force prices down to 13/3 1C, but hitherto they have failed, save in a few exceptional cases, when 13/4 has been taken. There has been a fair business doing in Siemens steel plates with coke tinning.

Railroad Construction for the First Four Months.

The *Railway Age* prints the following review of the situation:
Four months of the year 1886 have now gone and the season of railway construction is fairly open. Previous to May I comparatively little construction takes place, the long winters in the north and the early floods in the warmer latitudes presenting natural obstacles to the work of grading, bridging and track-laying, and the early part of the year also being chiefly required for maturing financial plans and collecting the material and forces for the forward work of the later seasons. In 1885 railway construction reached the lowest figure shown in this country for seven consecutive years, the total addition to our mileage being in round numbers only 3,200 miles. The present year opened somewhat under the depressing influence of the previous year, and although it has already been signalized by the projecting of numerous plans for railway extension, covering many thousands of miles, there has not yet been time for the active campaign to fairly begin, and of course not much track-laying could be expected up to the present. Nevertheless we find from returns received at this office that a very considerable extent of mileage has already been laid down, as the following table will show:

Track Laid During the First Four Months of

State.	Lines.	Miles.	State.	Lines.	Miles.
Alabama	1	9.0	Mississippi	...	4.0
California	4	43.2	Missouri	...	14.0
Illinois	3	83.5	N. Carolina	1	2.0
Georgia	3	15.0	Ohio	...	5.0
Indiana	1	10.5	Pennsylvania	2	16.0
Illinois	2	88.0	Texas	...	1,221
Indians	1	30.0	Wash. Ter.	3	37.7
Kansas	4	54.0	W. Virginia	1	4.0
Kentucky	1	34.0	Wisconsin	2	90.0
Louisiana	1	9.0	Michigan	1	1.0
Michigan	1	3.0	Tot. 22 states	40	666.5

It thus appears that we have a record of track-laying in the present year, in 22 of the States and Territories on 40 lines, which has already reached an aggregate of 666.5 miles of main track, not counting the very considerable mileage of sidings and of old track relaid. This total is about twice that reported up to the same period last year, although the winter of 1884-85 was much more severe than the one just passed, which would account in part for the small amount of construction last spring up to the same date; but the total given for the past four months is also larger than that for the same period in 1884, and, indeed, in any of the last 13 years excepting the four years 1880, 1881, 1882 and 1883, the aggregate of construction for 1882 exceeding that of any previous year in the history of the country.

It will be seen from the table that some track-laying has already been done in nearly half the States of the Union, although most of them report only one road each. The principal activity thus far appears to be in Texas, Wisconsin, Illinois, Florida and Kansas, and these figures are an indication of the very large mileage which is actually under construction in these States, as the record for the full year will show. Of the 40 lines referred to in the table track-laying is still in progress on at least 24, and these alone expect to add fully 1800 miles to their present mileage during this year.

The important characteristic of the construction work for the present year is the fact that it will be largely done by a few great competing companies, who have set out to parallel or head off each other's extensions in the most rapidly-growing and central portion of the Union. While also a large number of independent projects are on foot, many of which will take tangible shape if the labor troubles do not stop the wheels of enterprise, still the greater part of the new mileage for 1886 will be due to the progressive movements of the already great companies. Although it is too early to indulge in any definite predictions, there have already been laid out, and to a considerable extent entered upon, a sufficient number of new lines to make it reasonably certain that the aggregate of track laid in 1886 will be very considerably greater than in 1885, and probably greater than in 1884 also. As the year 1882, when the enormous amount of 11,560 miles of track were laid in the United States, marked the culmination of a period of extraordinary activity in railway building, so the year 1885 doubtless marked the end of a three years' period of rapid decline in construction, and we now seem to have entered again upon the up grade in this respect.

Certainly the prospect for manufacturers of railway material and supplies and for contractors and workmen in railway construction is very encouraging, provided always that irresponsible and idiotic labor agitators do not forcibly interfere to prevent the natural tendency toward activity and general prosperity.

Latest Legal Decisions.

COLLATERAL SECURITY.

O., who was carrying a quantity of canned goods, procured from T. a loan, and in the note given these goods were mentioned as collateral security therefor. O. also gave storage receipt to T. as for these goods. In April O. executed a deed of trust for the benefit of creditors, which was duly recorded, and the trustees went into possession of his property, in which was included these canned goods. In June following T. brought an action of replevin against the trustees, in the United States Circuit Court for the District of Maryland—Thurber vs. Oliver—but was defeated. Judge Morris, in the opinion, said: "There was clearly here only a pledge of these goods, for there was a condition of payment of the loan, which, if fulfilled, would restore the property to the borrower. That being the case there must have been a delivery of the pledge to make it effective. To constitute a pledge the pledgee must take possession, and to preserve it he must retain possession. The delivery and possession required is not a mere agreement of parties which they can make on paper, but must be some sufficient act of an unequivocal character. The rule of law is upheld and inexorably applied by the Supreme Court of the United States in *Casey vs. Cavasse*, 96 U. S. 467, where it is said: 'A pledge and possession, which are the essential ingredients of a security of personal property, must be made out or the privilege fails.' A few cans of the goods were delivered to H., who was the plaintiff's agent after the completion of the transaction, as samples to sell by, but this would not amount to a symbolic delivery under the statute here. It is urged by plaintiff's counsel that the wording of the note and the storage receipts evince an intention to deliver the goods. But evidence of intention is only to be considered when the act said to amount to a delivery is an equivocal act which might amount to a delivery or not, according to the intention of the parties. But an act which is not in the nature of a delivery, according to the thing to be delivered, cannot be made a delivery by agreement or intention. In this case the storage receipt being signed by one who did not keep a public warehouse it had not the effect of a negotiable instrument carrying with it the title to the property in store to any purchaser for value in good faith, but it is open to all claims against the maker, and as the creditor, through the trustees under the assignment made for their benefit, took possession of the property before the plaintiff asserted his right to it, they must prevail against him."

TRADE-MARK.

The Royal Baking Powder Co. sued D. for an infringement of their trade mark, and asked for an injunction. It appeared

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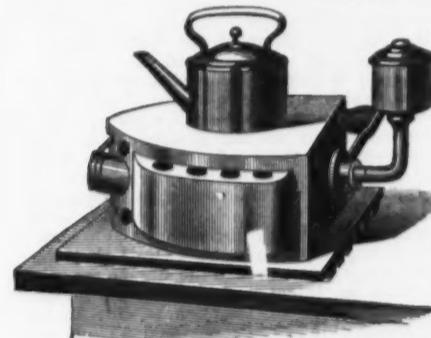
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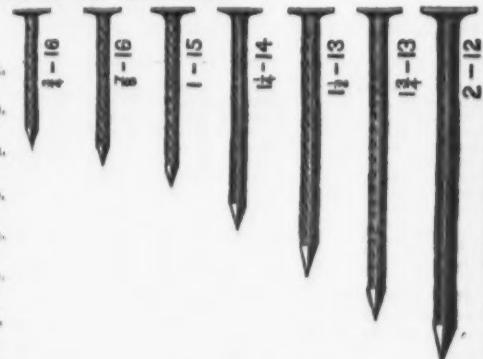
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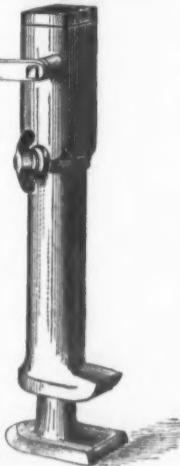
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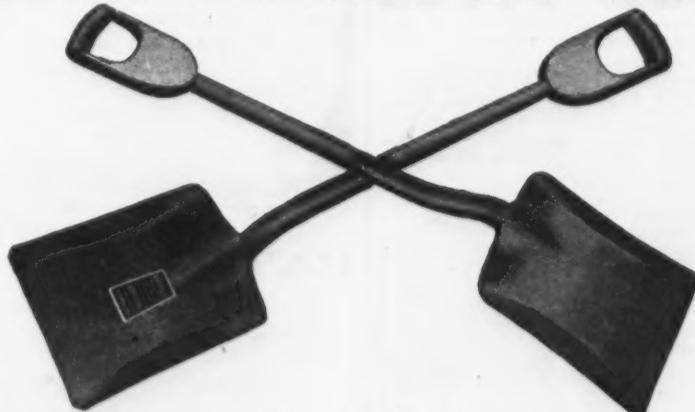
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New York, Thursday, May 13, 1886.

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REMOVAL.

The office of this journal is removed to 66 and 68 Duane Street.

Railroad Building and the Iron Trade.

It is appropriate at a time when events unfavorable to general trade are uppermost in the minds of both consumers and producers to call particular attention to one important factor which is quietly shaping the course of business. It is only too natural that a deep movement like the labor agitation of the past month, with its disquieting influences upon the individual manufacturer, its check upon business, should crowd out of sight facts which have never, we believe, been forcibly presented, though well known. It is, we believe, generally understood by the trade that this year will witness a very large increase over 1885 in the amount of railroad building. We print elsewhere the figures published by the *Railway Age*, covering the first four months of 1886 and 1885. It shows that we have doubled this year, even under adverse circumstances; we have done it in the months when track-laying is impossible in the very sections of the country where the greatest activity is expected.

It may be safely stated that this year will witness an addition to the railroad mileage of the country of at least double that of 1885—that is, about 6500 miles. It should be particularly noted that very few of the enterprises participating in this new work are speculative in the accepted sense of the word. Very few of them are floated with the aid of the general public, and therefore the raising of the funds for these does not depend, to the extent it would otherwise do, upon the temper of the outside speculative public. They are nearly independent upon the fluctuations of stock quotations in Wall street, and will be carried out unless something happens which cuts much deeper than labor agitation or failure of speculators. The bulk of the work is to be done by great railroad corporations in the West to secure traffic from new regions or capture a share of that controlled by rivals. It is not our intention to discuss the good policy of this movement from the standpoint of the railroads.

The Chicago, Burlington and Quincy are pushing their Chicago, Burlington and

Northern enterprise energetically toward the Northwest. The St. Paul, Minneapolis and Manitoba are pushing in the same direction. The Chicago, Milwaukee and St. Paul are, like the Northwestern, preparing to build 150 miles of feeders in Dakota, and are credited with the determination to have a line of their own to Kansas City. The Chicago and Rock Island are raising \$10,000,000 to build 700 miles of road in Kansas and Nebraska. In the former State the Atchison, Topeka and Santa Fé will construct 450 miles, and in addition thereto will push through the Indian Territory, and will build the connecting lines between it and the Gulf, Colorado and Santa Fé, the control of which they have recently obtained, and which will give them an outlet to the Gulf. They have called for funds to the extent of \$10,000,000, which were promptly furnished by their stockholders. In Nebraska the Union Pacific are opening out new territory in competition with the Chicago, Burlington and Quincy and the Chicago, Rock Island and Pacific. In Wyoming the Union Pacific are having a new rival in the Chicago and Northwestern, whose stockholders have been asked to authorize a loan of \$20,000,000, of which about one-quarter is to be used at once for construction purposes.

In the South, the Southwest and on the Pacific Coast a number of enterprises have been matured and are practically beyond the danger of interference. In the majority of cases the money has been raised by the issue of bonds which, guaranteed by prosperous lines, have been marketed with little difficulty.

We know from the returns of the Board of Control that the rails for the majority of these new roads have been already contracted for, but the large amount of material required for equipment has not yet come into the market. It cannot be doubted that this business will considerably help some branches of the iron and steel trades now hampered by growing cost of raw materials and of labor, and by stagnant markets. It may to some extent counterbalance any falling off which there may be in the volume of general trade. The activity in railroad building, resting as it does on a sound basis and not on the flimsy schemes of irresponsible speculation, is a factor in the situation calculated to improve a good general trade should we have it, and to moderate continued depression should that be the outcome of the disturbances caused by the labor agitation.

The Spanish Copper Companies.

Since the United States have become the greatest producers of copper in the world, and have risen to a high rank as exporters, besides covering their own heavy home requirements, the values here are influenced to some extent by the doings of rivals in many different parts of the globe. The supremacy of Chili has long departed, and it must share on nearly equal terms with Spain and the United States. During the past three years the question which has above any other agitated the minds of all engaged in the copper trade has been, How do the different producers in the world stand the strain of low prices? who is being crowded to the walls, and who can survive? Our own miners have come out of this struggle triumphantly, favored by a series of circumstances. Chili, we know from the best of sources, is being pinched badly, but it is impossible to put forward figures to clearly illustrate how its profits have been shrinking and indicate what proportion of the mines must close at an early date. The Australian mines, we know from published reports of the leading companies, are losing money. In Venezuela the operations of the New Quebrada Co. have been a steady drain on its resources. In Germany the Mansfeld corporation is retrenching in every direction to keep expenditures within receipts, and as the only way out of the difficulty it is struggling hard to have the duty on copper increased, with fair chances of success.

Concerning the great pyrites companies of the Peninsula, the annual reports just issued clearly prove how the decline in copper has forced down dividends. The returns to shareholders of the three leading corporations, controlled chiefly by English capital, have been as follows during the last three years:

	1886.	1884.	1883.
Mason & Berry	3½%	8%	12½%
Tharsis Co.	10%	90%	27½%
Rio Tinto Co.	5½%	8%	14%

The largest producer in Spain, and in the world, not excepting the Calumet and Hecla Co., is the Rio Tinto, its estimated yield being fully 55,000,000 pounds, taking together the metal produced in various forms at the mines and that extracted in England, France and Germany from the pyrites shipped to manufacture sulphuric acid. The company have steadily developed the extraction of copper at their mines, as the following summary will show, the unit being the ton of 20 cwt.

Copper Production at the Rio Tinto Mines.

	1876.	1881.	1886.
1876	946	1861	9,466
1877	4,296	1862	9,740
1878	4,184	1863	12,295
1879	7,179	1864	12,668
1880	8,559	1885	14,565

The company, however, during the year brought to market and realized 16,246 tons. Their avowed plans are to carry the product to 20,000 tons, and with the enormous outlays to provide successfully for the necessary water supply, and the steady develop-

ment of their great deposits, there is no obstacle in their way. An idea of the magnitude of their operations may be obtained from the following table, giving the product:

Product of the Rio Tinto Mines.

	1882.	1883.	1884.	1885.
For shipment	259,924	318,291	312,028	406,772
Total treatment	688,307	786,682	1,057,890	944,694
	948,231	1,099,973	1,369,918	1,351,406

Average contents, per cent. 2.805 2.956 3.334 3.102

The processes of copper extraction are such that the metal is not exhausted from the ore being treated for years, and the result is that the company have enormous quantities in reserve in accumulated piles. At the end of 1885 the copper thus in reserve reached 64,643 tons, standing on the books of the company at a cost price of £615. On the other hand, the mine is loaded down with a very large capital, £3,250,000, and a heavy bonded debt, £3,473,200, which, at 5 per cent., constitutes a heavy charge on their operations—about \$850,000 annually. The net profit available in 1885 was £101,775, out of which dividends aggregating £178,750 were declared. Taking into account the fact that considerable sums were paid out to withdraw bonds, to provide for a reserve fund, it will be conceded that, while the company have ceased to make magnificent profits, they are still in a position to produce heavily, and probably will aim at an increase of output.

The second great pyrites company of Spain is the Tharsis, which mined in 1885 587,303 tons, against 518,522 tons in 1884, shipping 311,151 tons, against 206,939 in 1884, while the shipment of copper precipitate dropped from 7095 in 1884 to 6110 tons. This, however, was due to the fact that the company held back a part of the product, which was slightly greater than that of the preceding year. The Tharsis Co., in contradistinction to its great rival, the Rio Tinto works its pyrites itself, and it has made strenuous efforts late to market the residue from the roasting in the manufacture of sulphuric acid. This residue, or "blue billy," has been freely offered for sale in this country during the past few months. The net profits from all sources were £104,211, and a part of the reserve was drawn upon to pay the 10 per cent. dividend. The shareholders authorized the directors to issue debentures not to exceed £400,000.

Taking a general review of the situation it may be stated, therefore, that little or no relief is to be expected to the copper market from any restriction of operations on the part of the large Spanish mines. They are, in fact, in a position where they cannot and need not stop, and unless cholera deprives them of their working population they will go on turning out growing quantities of copper.

The New York Underground Wire Commission.

It is now nearly two years since what is commonly known as the Underground Wire Bill passed the New York Legislature. The act was to the effect that all the wires of this city should be placed below ground by November 1, 1885. The succeeding year the Legislature provided for the appointment of three Commissioners of Electrical Subways, whose duty it should be to see that the previous law was properly enforced. This commission, since the date of their appointment, have been actively at work, or perhaps we might better say ostensibly engaged in, investigating the plans and devices, systems and schemes which have been submitted to them by the multitudinous inventor. The speedy termination of their responsibilities and the adoption of what, in their opinion, is the best means, have been much hampered by the fact that each commissioner receives \$5000 annually for holding his office. It should also be borne in mind in this connection that, as none of the gentlemen who composed this body were electricians or scientific experts of any kind, it was necessary that some little time should pass before they could become even moderately familiar with their business. The law by which they were appointed further read that their terms of office should expire November 1, 1887, or sooner if the fulfillment of their duties would allow it. So long a time having elapsed without the commissioners indicating in any way that their work was progressing, a resolution was recently adopted by the New York Senate requiring that they give a report of what they had accomplished. The report furnished to the Senate was one of progress only, and was very brief. It gave information as to the number of plans examined, and told what work had been done toward formulating a plan that would meet the requirements of the case as presented in New York. The report further announced the death of Commissioner Loew, which had occurred but a few days before. The work of the commission was suspended until a third member should be appointed to fill the vacancy.

Such is the present status of the Electrical Subway Commission, and the most noteworthy result that they have thus far accomplished has been to relieve the city treasury of a number of thousands of dollars. Perhaps they may do something before their time expires, when a new commission will probably be appointed to succeed them, but if the record of the past is a safe standard to judge of the future they will retire from office in the pleased possession of salaries received, if not in the happy consciousness of work done. A similar commission appointed for the city of Brooklyn, from which a report was likewise demanded by the Senate, had approved of a plan for putting the wires underground, and have already done considerable work in the laying of cables. When the subject was first agitated it excited a very wide interest, and the superior advantages of underground wires were familiar to all. So long as there was a prospect of the plan being carried out this interest continued, but when month after month passed without definite action being taken the public mind became dormant, and the meetings of the commissioners were neither spoken of nor thought of. Whatever may be the final outcome, or however soon it may occur, there is no question but that overhead wires are both a nuisance and a danger. The claim of the various electrical companies that submarine wires were impracticable was long ago shown to be largely a creation of the interested fancy, and, in fact, there is no reason, either scientific or social, why the streets of the city should be longer encumbered with a plexus of wire, as they are at present.

The Knights of Labor.

The Knights of Labor are already threatened with dissolution on account of the rank and file refusing in many instances to be controlled by their officers. The most notable instance was in the case of the Southwestern strike, where Mr. Powderly's suggestions were scorned and the main body rushed on to defeat. Another instance which comes nearer home results in the resignation of Joseph O'Donnell and two other members of the Executive Board in New York, the Third Avenue Railroad strikers having refused to recognize their agreement with the company to resume work. The Mallory boycott at Galveston results in two well defined factions, whose positions respectively seem irreconcilable. Mr. Powderly and his associates of the National Executive Committee understand the situation exactly, and have called a general assembly for the following reasons:

1. The rapidly-increasing membership of the order requires changes in the laws which the General Executive Board have no authority to make.

2. The laws in relation to the government of boycotting are wholly inadequate to compel obedience on the part of assemblies that believe in boycotting for every offense, whether great or small.

3. The laws in relation to strikes do not give the General Executive Board power to interfere in such matters until after the strike has been inaugurated.

4. The order has become involved in difficulties with trade societies, and an effort is being made to create a rupture between these societies and the Knights of Labor.

The Knights of Labor are a body capable of exercising an immense influence for good, but not so long as any rattle-brained demagogue who happens to secure control of a district assembly can defy the national executive and make the whole order appear before the public as a dangerous nuisance. To carry out the purpose of its organization it needs a capable head with autocratic powers, able to compel implicit obedience on the part of those subordinate in authority, and wise enough to use with prudence and judgment the formidable power at his command. It looks very much as if this once dreaded order was about to become the representative of order and conservatism, and the only check upon the dangerous tendencies of trade unions to abuse the opportunity for mischief which organization gives them. The fact that the Knights are being antagonized by the anarchists and by most of the national trade unions is significant. So long as this formidable order lent itself to every scheme which the professional agitators might invent, and helped to make strikes formidable and boycotts effective, it was lauded and supported; now that it proposes to become conservative, those who have used and well-nigh ruined it discover in it a danger and a menace to the interests of organized labor. If the Knights of Labor can safely pass this crisis they will find themselves in a position to command public confidence and to effect an alliance between labor and capital which the trade-union leaders have not wanted and could not have secured.

Mr. Powderly's recent circular letter disproving the folly of the Knights of Labor, and counseling them to refuse longer to be willing tools in the hands of the professional agitators, is not likely to make as profound an impression as his circular letter of March 13. Mr. Powderly is a man of curious contradictions. He can talk like a sage when it pleases him to do so, and like a fool when bad influences lead him in that direction. His convictions are right, but he lacks the courage of his convictions, and does not know when to stand up to what he knows to be right. Up to a very recent date he was regarded as a professional demagogue, ignorant of everything except how to organize labor and make it pay him a living. His circular letter of March 13 brought him prominently before the public. It was discovered that he was a man of conservative views, with a much clearer insight into matters affecting the welfare of labor than he was accredited with holding. Employers were surprised and pleased. They saw in this declaration of principles a ground for hope that the Knights of Labor were, after all, a great conservative force, seeking the good of labor by reasonable and helpful means, and not by strife, destruction and violence. Had Mr. Powderly been content to remain silent it would have been well for him. The public would have believed that he was powerless to prevent the abuse of the order, until his hands were strengthened by the conservative portion of the membership. His subsequent course destroyed this confidence in his intelligence and force of character. After condemning the Southwestern strike as a causeless outrage, he gave them official sanction and called upon the order to support them. Because of personal pique he opened a public correspondence

consistent. No one can accuse him of blowing hot and cold. He is thoroughly dangerous and possesses a vast capacity for mischief. He can make the Knights of Labor a terror for a short time, and effectually wreck the whole order before the end of the year. Men of this type have very little respect for Powderly. They have "no use" for a man who has lucid intervals and is capable of condemning strikes, denouncing boycotts and advising the practice of temperance. They resent good advice, and condemn as weak and unmanly any utterances which do not ring with denunciations of the tyranny of capital and the wrongs of labor. At the coming general assembly these antagonistic elements in the order will come face to face to contend for the control. If Mr. Powderly had been consistent to his principles as forcibly stated in his circular letter of March 13 he would be the strongest man who could be named. Whether his latest utterances will rehabilitate his tattered reputation as a man of sound sense and good judgment, we do not know. We hope so, for if his following is scattered there is serious danger that Irons, or some man like him, may secure election before the strength of the irreconcilables is realized. The antagonism of the leading trade-union officers is significant, but, so sure as this triumphs, so sure will the order go to pieces.

Condition of the Blast Furnaces of the United States, May 1, 1886.

We present herewith our usual monthly statement relating to the condition of the blast furnaces in the United States to show what changes have taken place in the number of furnaces in and out of blast and their capacity. With a view to attaining as great accuracy as possible we have somewhat modified the system by which these statistics were gathered, the estimates we publish this week being the result of a critical examination of the returns of several hundred correspondents. Recognizing that there have been during the past few years many causes at work to materially affect accepted estimates of capacity of individual furnaces and of entire districts, we have appealed directly to the producers, and have been guided largely by the principle that, with the record of the make of the preceding month as a basis, the unavoidable fluctuations in the output of individual furnaces would be largely compensated for in aggregates of entire districts. Our endeavors have met with so much encouragement that we present the accompanying table as the closest approach to a conservative estimate.

We may state in this connection that we have carefully gone over the lists of furnaces, and have dropped from them a considerable number which were known to have been abandoned. This reduces the number reported out of blast, and, we believe, much more closely represents the reserve capacity. We have done this in a very conservative manner, and know that quite a number of those which are still being carried along as possibly capable of again producing iron are in reality looked upon by the best-informed authorities in the trade as practically dead. The value of any statement touching the furnaces out of blast would be largely enhanced if it were practically possible to segregate from them those merely idle for relining or for other repairs. These are furnaces really on the active list, capable of making pig iron at present prices and preparing to re-enter the ranks of producers as soon as possible.

Turning now to the anthracite furnaces we find that in New York the April product was about 14,470 gross tons, in which the output of three furnaces was estimated. The Cedar Point Furnace is now relining. In New Jersey all of the seven furnaces in blast report an aggregate product of 12,244 tons, of which, roughly, one-half was made by three furnaces running on Bessemer pig. Out of the 39 furnaces in the Lehigh Valley, 31 report to us an aggregate make in April of 39,551 tons, and estimating that of the others at 7890 tons we reach a total of 47,441 gross tons. In the Schuylkill Valley 12 furnaces made 10,959 tons, so that the total, with five not reporting, reaches 24,559 tons. From the Upper Susquehanna Valley we have returns of the April product from every furnace which was in blast during that month, the total being 17,044 tons, while official reports and estimates by good authorities make the output of the Lower Susquehanna Valley 39,494 gross tons. Adding the make of the one anthracite furnace in blast in Maryland, we have, therefore, a total output of anthracite pig of 156,681 gross tons. Of course a very heavy proportion of this product never reaches the open market, being consumed by the rolling mills and steel works which produce it. Thus the furnaces connected with steel works alone turned out 33,628 tons in the aggregate, and a number of furnaces owned by others are producing large quantities of Bessemer pig. In fact, a part of the increase in the capacity of some of the furnaces is due to their running on Bessemer stock.

Among the stacks which may blow in during May are one of the Glamorgan Iron Co., the second one belonging to the Chestnut Steel Co., and the Vesta, in the Lower Susquehanna Valley, being leased by the Columbia Rolling Mill Co.

Ten furnaces in the Shenango Valley report an April product of 24,232 tons, which,

with that of two not reporting, makes an estimated total of 30,132 tons. In this district there is considerable movement among the furnaces now idle to prepare for active work. The Ella will blow in toward the end of May. Henderson Furnace, now leased by Oliver Brothers & Phillips, of Pittsburgh, is to go into blast as soon as possible, and the Sharon Furnace is reported to be getting ready. In the Juniata and Conemaugh valleys the output of all the furnaces in blast, with the exception of two small ones, was officially reported at 23,547 tons. In that district the Franklin Furnace, recently started, had not yet in April reached normal capacity. In the Youghiogheny Valley the furnaces are doing average work, while a temporary banking at one of the furnaces in Allegheny County reduced the output of that one stack somewhat, without, however, having any noteworthy effect upon the total. The April output of all the bituminous and coke furnaces in Pennsylvania was, according to our returns, estimating the make of a few unimportant concerns, 108,323 tons.

In Ohio we have returns from every furnace in blast during April in the Mahoning Valley, showing the aggregate output during that month to have been 29,785 gross tons. With the exception of one or two stoppages for a few days at a time, the furnaces have been running to full capacity. Since no steps are being taken, so far as we are advised, to blow in any additional stacks, it may be stated that in a district in which individual output fluctuates more, probably, than in the majority of others, the maximum work is represented by 30,000 tons. In the Hocking Valley the Fannie has blown in during the month of April, so that the production in May will be a little greater than that of last month, when it was about 8510 gross tons. In the Hanging Rock district the Milton blew in early in April, and the Sarah, now out, may be producing pig iron during this month. The product of April was close to 8000 gross tons. In the other furnaces in Ohio not classified under the districts mentioned the output was about 26,630 tons, including the make of the Bellaire Furnace for a part of the month, now out, to be rebuilt. Thus the aggregate total output of the bituminous or coke furnaces in Ohio was 73,834. Very few changes have taken place in that period, and the make in May will not differ from it much, unless exceptional circumstances occur.

Illinois, with nine furnaces, connected all of them with Bessemer steel works, produced in April 37,411 gross tons. In Missouri there is considerable preparation to resume work. The second of the Missouri Furnace Co. went into blast on the 5th inst. The furnaces in Indiana are running full, and one in Wisconsin is producing.

Turning southward, we may note that in Maryland the Catoctin Furnace, formerly running with anthracite as a fuel, blew in early in May with coke. In Virginia some of the furnaces were troubled in April by high water. Their total product was 7411 tons. In West Virginia the make was about 9412 tons, the bulk of it Bessemer pig. The old Ironton Furnace has been torn down, and a new one, with a capacity of 225 tons weekly, is building. Kentucky produced 2426 tons of coke pig, including some iron made in the beginning of the month by the Licking Furnace, which blew out. In the South Tennessee and Alabama have each gained one furnace and are making more pig.

We have not in every case segregated the furnaces making spiegeleisen from those producing other grades in the same district. From our returns we estimate the total make of spiegeleisen and ferrromanganese during April at 3653 gross tons, which includes the product of one furnace which blew out toward the end of the month for relining.

The number of charcoal furnaces in blast has not as yet increased much, but there are indications that the capacity will be increased during the current month. The product of the New England furnaces is officially reported at 1320 tons for April, while that of New York, with two furnaces running only part of the time and another just blown out, was 1139 tons. The Pennsylvania charcoal furnaces made a little less. In Maryland two furnaces out of three began operations only in the middle of the month, so that the product will come up to capacity only during the current month. In Virginia three furnaces are preparing to start, but it is not likely that they will figure to any extent in the make of May, as their preparations will not be completed until toward its close. In the Hanging Rock region—Ohio—only one furnace is at work, but two others report to us that they will enter the list, one of them, in fact, having probably gone in by this time. With the aid of reports from nearly every furnace running in Michigan we estimate the actual make in April at 10,882 gross tons. One of the active furnaces has gone out of blast, but will go in again as soon as possible. Two others, the Antrim and Eureka No. 2, will be or are already making iron. In Wisconsin the York Iron Co., at Black River, may blow in this month, though possibly its preparations may carry it into June. On the Pacific Coast the Ironton Furnace, Washington Territory, will blow in May. The Hotaling Furnace in California blew out during the month.

Reviewing the situation generally, it may be stated that both in the make of anthracite

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES, MAY 1, 1886.

(Compiled for The Iron Age.)

Location of Furnaces.

	Charcoal.			Anthracite.			Bituminous or Coke.		
	Total number of stacks.	Number reported in blast.	Capacity per week.	Total number of stacks.	Number reported out of blast.	Capacity per week.	Total number of stacks.	Number reported in blast.	Capacity per week.
New England	14	5	506	9	430	.....	.....	.....	.....
New York	10	3	440	7	570	34	14	4,175	10
New Jersey . . . . .	.....	.....	.....	16	7	2,850	9	2,375	.....
Pennsylvania	27	51	307	22	1,050	.....	3	2	135
Lehigh Valley . . . . .	.....	.....	.....	48	39	11,526	9	2,300	.....
Schuylkill Valley . . . . .	.....	.....	.....	44	17	5,726	27	5,655	I I 550 0 0
Upper Susquehanna Valley . . . . .	.....	.....	.....	21	12	3,975	9	1,770	.....
Lower Susquehanna Valley . . . . .	.....	.....	.....	38	27	9,214	11	1,350	.....
Pittsburgh . . . . .	.....	.....	.....	.....	.....	.....	16	12	11,225 4 3,925
Spiegel . . . . .	.....	.....	.....	.....	.....	.....	1	1	500 0 0
Allegheny Valley . . . . .	.....	.....	.....	.....	.....	.....	2	1	500 I 80
Shenango Valley . . . . .	.....	.....	.....	.....	.....	.....	23	12	7,585 11 4,960
Youghiogheny Valley . . . . .	.....	.....	.....	.....	.....	.....	6	5	1,630 I 400
Juniata and Conemaugh Valleys . . . . .	.....	.....	.....	.....	.....	.....	21	14	4,724 7 1,070
Maryland	14	3	300	11	575	4	1	330	3 440
Virginia	24	2	90	22	1,027	.....	2	0	0 2 300
North Carolina	2	1	120	1	90	.....	12	5	2,165 7 2,130
West Virginia	3	0	0	3	165	.....	.....	.....	.....
Ohio—Mahoning Valley . . . . .	.....	.....	.....	.....	.....	.....	6	4	2,196 2 470
Central, Eastern and Northern . . . . .	.....	.....	.....	.....	.....	.....	17	12	6,050 5 2,300
Hocking Valley . . . . .	.....	.....	.....	.....	.....	.....	17	12	6,056 5 1,950
Hanging Rock	18	1	100	17	.....	.....	15	10	2,161 5 795
Miscellaneous	2	0	0	2	420	.....	.....	.....	.....
Kentucky	3	1	100	2	200	.....	3	2	745 1 350
Western Region and Miscellaneous . . . . .	.....	.....	.....	.....	.....	.....	10	7	2,950 3 1,250
Tennessee	10	3	800	7	550	.....	2	2	1,000 0 0
Georgia	2	0	0	2	150	.....	10	8	4,550 2 360
Alabama	11	8	2,100	3	375	.....	2	2	410 0 0
Illinois . . . . .	.....	.....	.....	.....	.....	.....	16	9	8,708 7 2,870
Michigan	25	9	2,363	16	3,701	.....	2	0	0 2 580
Wisconsin	10	2	315	8	852	.....	3	1	550 2 600
Minnesota	1	0	0	1	210	.....	.....	.....	.....
Missouri	4	2	670	2	463	.....	7	1	550 6 2,980
Texas	2	0	0	2	330	.....	.....	.....	.....
California	1	0	0	1	245	.....	.....	.....	.....
Washington Territory	1	0	0	1	185	.....	.....	.....	.....
Oregon	1	0	0	0	0	.....	1	0	0 1 600
Total	185	45	8,211	139	11,588	208	119	37,931	79 19,565 212 120 67,888 83 30,200

and bituminous and coke furnaces there has been no notable increase, and that the prospects, so far as the reports of the furnaces out of blast indicate, do not point to a marked movement toward blowing in during May. In Western Pennsylvania and in some parts of Ohio the rise in coke and in freights on ore, together with the more doubtful present outlook in the markets, will discourage any accessions. To-day the advances in cost more than compensate for the rise during the latter part of last year. As for the charcoal furnaces, an increase may be looked forward to.

WASHINGTON NEWS.

(From Our Regular Correspondent.)

WASHINGTON, D. C., May 11, 1886.

TARIFF IN THE SOUTH.

Ex-Representative Buckner, of Missouri, who was chairman of the House Committee on Banking and Currency, is in the city, and, speaking of the relations of the South to the tariff, remarked to the correspondent of *The Iron Age*:

"The attitude of the South has been generally misunderstood by her own representatives. That question must be viewed in its relations to the economic conditions of the South to-day, not as they were 40 years ago. You will find that the champions of protection from the South were in advance of those from New England. The great States of New York and Pennsylvania, of course, were its most persistent advocates."

"How do you account for the change in the South?"

"That it very clear. In the early days of the Government the statesmen of the South tried every expedient to get rid of slavery. With the old time straight-laced notions of State rights such a *dernier resort* as appealing to the National Government as a way out of the dilemma was never thought of. Failing to get rid of slavery the next thing was to make the best of it. The South was compelled to accept the situation. Slavery was a fixed fact, and as agriculture was its only field of employment the greatest freedom for agriculture was supposed to extend the markets for its products. It was simply a question of slave labor and agriculture against free labor and manufactures. The latter sought a monopoly of the home markets through protective legislation; the former demanded foreign markets and cheap foreign goods through free trade. It was after all a question of the cheap labor of slaves or protected free labor of American citizens. History shows that Calhoun, of South Carolina, in 1816, was one of the most ardent protectionists, when Webster, of Massachusetts, was a fierce free trader."

"You think that Southern interests require a change of policy on the part of her representative men?"

"I do. I believe in protection. I believe the South is more interested in it to day than the Middle States were 50 years ago. The cheap wheats of

THE WEEK.

The United States consul at San Domingo is Henry C. C. Atwood, of New Orleans, re-appointed. He has faith in the future of that country, especially as promising profitable investment for American capital, which at present is the special need. "Just think of a Government being compelled to pay from 3 to 5 per cent. to a local syndicate a month for money, as is done down there. This will not, however, be the case much longer. I carry a proposition to the San Domingo Government from a company of New York capitalists in regard to the establishment of a bank there, which, if accepted, will place the financial affairs of the country on an entirely new basis. Another company is considering the project of building a railroad right through the island to open up the interior portions." The population is about 300,000, and trade with the United States amounts to about \$2,000,000 per annum.

We have received from the Italian consulate in this city a copy of a decree establishing the details of an international competition in sowing machines (agricultural) which will be opened at Foggia, October 20. Machines to sow in rows and to scatter the seed, as well as those to sow seed and distribute manure at the same time, will be admitted to the competition, in which all foreign as well as national inventors, constructors and agents can take part. Applications must be forwarded to the Executive Commission not later than September 20.

The President has under consideration an appointment to the Paris consul-generalship, which he regards as important, in consideration of the influence upon American trade which he believes could be exercised by an intelligent and energetic supervision of the French exports to the United States and the accuracy of the invoice prices, &c.

An Albany report says the measure introduced into the Legislature to prevent railroads from giving rebates to shippers, so as to prohibit the sending of grain through the canal, is practically dead.

M. Granet, Minister of Posts and Telegraphs, has granted a charter to a French company to lay a new cable between Brest and New York, via Guadeloupe. The State guarantees a portion of the capital on condition that the cable be manufactured in France and be laid by French vessels.

The Mexican reciprocity treaty experiences another unexpected check. The report of the Committee on Ways and Means presented to Congress emphatically condemns the measure, not only as unequal in its operation upon the two countries, but because of the admitted inability of the Mexican Government to enforce existing treaties.

The Mississippi Supreme Court has sustained the validity of the privilege tax law, which imposes a tax of \$25 on all persons traveling and selling by sample.

The season of navigation opened this year at Montreal under very promising auspices,

and shipping companies are promised a profit for the first time in several years. The rates of freight on grain are 2/9 to Liverpool, and 3/ to London, Glasgow and other British ports.

The almost unprecedented dullness on the New York Cotton Exchange noticed during the past week excites a variety of conjectures respecting the cause. The president of the Exchange, Siegfried Gruner, said: "It would indeed be very difficult to say accurately what are the causes for the present decline in the cotton business. Speculation, it is true, has not been so lively, but there is a general depression everywhere, and the cotton trade is not worse off, I apprehend, than other interests. The tendency of the times is to do business direct between the points of production and consumption. We shall not handle much cotton here anyway, as the mills generally go to the planters for most of their product and come East at the close of the season. There is no special trouble that I know of which prevents us from doing more business. The depression seems to be due from various causes, for the most part natural."

The Knights of Labor in Chicago denounce violence. Alexander Sullivan, of Chicago, ex-president of the Irish National League of America, says: "The intellectual workingmen of this country know that violence is not an American remedy. They also know that the workingman of to day may to morrow be the employer, next year the capitalist. This change, they also know, is brought about by industry, sobriety and peace."

Lumber dealers in the Saginaw Valley, Mich., complain of unusual dullness, a great change having come over the market during the past month.

The mischief caused by the presence of Anarchists and Socialists in our large cities is causing the presentation to Congress of many schemes designed to restrict immigration, but there is little probability of any change in the immigration laws, at this session.

The visible supply of grain, as reported both by the Chicago Board of Trade and New York Produce Exchange, comprises 43,250,000 bushels of wheat and 11,800,000 bushels of corn, which is a decrease of 1,306,000 compared with the previous week.

Sidney Dillon, ex-president of the Union Pacific Railroad, purchased the residence No. 23 West Fifty-seventh street, near Fifth avenue, for \$235,000. This is the highest price paid this year for a permanent resi-

which were the work of months by only a few concerns in the world are produced every day in Pittsburgh. Steps are taken to expand the size almost indefinitely.

The manufacturing industries of Augusta, Ga., show remarkable development. The city now has 11 cotton factories which absorb all of the cotton brought to that market. They give employment to 4000 hands, pay out over \$1,000,000 annually in wages, and manufacture yearly goods valued at \$5,000,000. The population has doubled in the past 10 years, and the taxable property has more than doubled in the same time. A Philadelphia firm are now building a factory in Augusta which will cost several hundred thousand dollars and give employment to a large number of skilled operatives. All the factories are now running on full time.

The statistics of France's foreign trade during the first three months of the current year show the imports to have amounted to 1,063,250 francs, as against 1,160,000 in 1885, and the exports to 737,500,000, as against 731,750,000 in the first quarter of last year. The decline in imports has chiefly affected raw materials.

The chief engineer of the Gas Trust Co., in Philadelphia, has been authorized to change the Ninth Ward Gas Works to the Steadman, Stanley & Klerne Patent and Regenerative System, and accordingly Jas. R. Floyd and George F. Kreischer, of New York, have contracted to make all the necessary changes to the plant for \$135,800, one stack to be ready November 1 and the other December 1 of this year.

Carroll D. Wright, the Commissioner of Labor, has written to Secretary Bayard on the subject of American representation at the congress to be held at Bordeaux for the promotion of technical, commercial and industrial education. He says: "Of the propriety of participating in the proposed congress it seems to me there can be no doubt, for this country must adopt every means to develop the highest industrial skill of its mechanics. We have lost something in the past because of the greater progress in this direction of other countries in competition with the United States. Any course which will enable those engaged in developing mechanical skill to acquire a knowledge of the methods practiced by other countries would be of the highest value to our own industries, and I should hope that the Government would take steps to participate in the suggested congress at Bordeaux."

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dence, with the exception of the one purchased a few months ago by Mr. Crocker, the Californian, who bought the Fifty-eighth street residence, in the rear of the one just mentioned, for \$250,000.

That Philadelphia workmen are so pacific is attributed to the fact that they generally own the houses they occupy, and so share with the most opulent in the common interest.

Pittsburgh, according to the *Times*, every wheel is going, and the output of products was perhaps never greater.

Provincial Secretary Fielding's resolutions favoring the secession of Nova Scotia from the Canadian Confederation were carried in the Nova Scotia House of Assembly on Saturday night by a vote of 15 to 6. How to get out?—there is the rub.

A member of the Central Labor Union who acted as chairman of the arbitration committee which waited on the proprietors of the Chelsea Jute Mills was arrested to answer to an indictment for "conspiracy and coercion."

The Manhattan Elevated Railroad has advanced wages to guards, conductors and gatemen, the increase to take place annually for three years.

At a meeting of the Furniture Manufacturers' Association in Chicago on Sunday night the following resolutions were adopted: "Resolved, That hereafter no member of this association will knowingly employ in his factory any communist, anarchist, nihilist or socialist or other person denying the right of private property or recommending destruction or bloodshed as remedies for existing evils. Resolved, That this association hereby agrees that ten hours shall constitute a day's labor, but any manufacturer whose orders are not sufficient to warrant his keeping his factory open for so many hours may regulate the hours of labor by the demands of his business, and wages shall be paid by the hour on the old terms."

The tin and sheet-iron workers at the meeting of the Central Labor Union in this city on Sunday announced that they had been successful in their demand for nine hours. The United Brass Workers decided to await the action of the convention in Pittsburgh.

Chairman O'Neill, of the Labor Committee, inquired of Assistant Secretary Fairchild at the Treasury whether the department could not cancel the contract of Kimball & Co., of Minneapolis, because it had been sublet to convict contractors at Joliet, on the ground that all sub-contracts must be approved by the department.

Mr. Fairchild replied in substance that the department could not take cognizance of the existence of a sub-contract, and must hold

the principal responsible only for the faithful performance of his work.

Consul Wingate, of Foo Chow, makes significant statements designed to show the methods adopted to drive American merchant shipping from the seas. He says the reappearance of sailing vessels as carriers of tea to London is owing to the high freights charged by what are known as the conference steamers, which have combined to monopolize the tea trade, and which have been able to prevent outside steamers securing cargoes. To prevent outside steamers entering into competition the conference steamers have given through bills of lading from Foo Chow to New York via London for one half what they were charging for carrying tea to London only. This policy simply precludes competition except by slow-going sailing vessels.

The piano strikers in New York have abandoned the movement for shorter hours until they shall be more perfectly organized.

Five policemen and six workmen are already dead as the result of the recent riot in Chicago.

The superintendent of the Mint in Philadelphia, being overwhelmed by an accumulation of nearly \$100,000,000 in coin, has decided to store \$20,000,000 in the Post Office. One vault contains \$40,000,000 in gold, and the enormous quantity in hand is spoken of as "a nuisance."

The report of the New York City Fire Department for the year 1885 contains an elaborate tabulation of the fires which occurred in this city during the year, arranged so as to indicate the nature of the risks involved. The total number was 2,379, of which 465 originated in manufactures and workshops. A general recapitulation shows that heating arrangements were responsible for 521 fires, and 60 were due to defective buildings and construction. No less than 1,763 fires had their origin in carelessness alone, involving a loss of \$1,718,341, against 375 classed as purely accidental, involving a loss of \$451,720. Spontaneous combustion of oily rags, rubbish, &c., was the source of 60 fires. Kerosene lamps also maintained their character for destructiveness, producing 272 fires. Beams built into chimneys and fireplaces produced 20 fires, foul chimneys 183 and sparks from electric lights 9. Incendiarism is accountable for 10. The total losses are placed at \$3,789,283, of which \$999,353 were on buildings and \$2,789,930 on contents.

Chief Ebersold, of the Chicago police, reports that the general meeting of the Trade Union on Sunday decided that "their fight

was already lost, as the bomb-throwing had caused the sympathy of the public to turn against all strikes. They therefore gave each branch power to decide for itself what was best to be done."

The *Journal des Débats* and the *Temps* are quite correct in the opinion that "American common sense will crush in the bud anything really approaching a socialistic revolution."

The American fishing schooner David J. Adams, of Gloucester, was seized by the Canadian steamer Lansdowne, in Digby harbor, Nova Scotia, last Friday, for breach of the fishery laws. Immediately there is great excitement at Washington, Ottawa City and London, but it is a relief to know that in the opinion of the British Minister at Washington, Mr. West, no serious differences are likely to arise, although there is "nothing but the miserable old treaty of 1818 to fall back upon."

The Southwestern extension of Missouri Pacific and other lines, for which 2000 men had been engaged, is indefinitely postponed on account of labor troubles.

The sugar refiners on the Pacific Coast are engaged in a war for mutual extermination, prices being mercilessly cut on either side.

The Cromwell steamer Louisiana made the trip from New York to New Orleans, from wharf to wharf, in less than five days.

Mr. Hewitt's bill for the establishment of a new tribunal of justice, to have jurisdiction of customs cases, is chiefly objected to for the reason that, as first outlined in the bill, it did not reach the seat of the difficulty. The present trouble is chiefly between the importers and appraisers, and has been aggravated by the fact that the latter have been almost wholly in subjection to certain special agents who are alleged to deal unfairly.

Superintendent Murray of the New York police says the force should be enlarged to at least 4000 men. The present force is 1900.

A strike in the Missouri Safe Works was compromised by the firm advancing the wages of several men in one of the departments, the engineer who went out was to be reinstated, and nine hours to constitute a day's work.

The Steamship Aller, North German Lloyd Steamship Co., just arrived at this port, can fairly claim to be the peer of any ocean steamship afloat. Her dimensions are as follows: Length, 455 feet; breadth, 48 feet; depth molded, 36 feet 3 inches. She was built by John Elder, of Glasgow, in less than 10 months, at a cost of about \$920,000, being the sixth steamer built for this line at these works during the last five years. The vessel will accommodate 224 first-class, 94 second-class and 850 third-class passengers, and officers and crew to the number of 170. The Aller is a distinct advance in point of speed and economy of working, on account of the construction of her triple-expansion engines and boilers. During a six hours' trial run the coal was weighed from the bunkers before being handed to the stokers, and, as about 130 miles were run against tide throughout, the results may be depended upon. The indicated horse-power was 650, and produced 69 revolutions, with a coal consumption of 1.4 per indicated horse-power. The coal was Scotch, and was served to 36 furnaces fitted with Fox's corrugated flues. The six boilers are of steel, and the gauge showed 150 pounds pressure to the square inch without variation. As compared with the compound engines of the five ships now running the economy is remarkable. To develop 6000 indicated horse-power in the compound engines by the same builders require a consumption of 130 tons per day of 24 hours. In these triple-expansion engines the consumption is 90 tons. She came from Southampton in seven days, without any straining of her machinery, and is expected to be able to make 450 to 500 miles a day with the consumption of 100 tons of coal or less.

The savings banks in Charleston, S. C., have 1057 colored depositors, who have to their credit a total of nearly \$125,000. The largest colored depositor in the Carolina Savings Bank, who has \$6747.30 to his credit, is a pure-blooded African, but a born financier. He has recently bought a valuable plantation for \$10,000 and has paid \$7000 of the purchase money.

A modus vivendi has been concluded by England with Spain, pending the resumption of the negotiations for a commercial treaty securing England the "most favored nation" treatment.

The gross cost of State prisons in Massachusetts last year was \$904,000; net cost, \$640,000.

Five hundred masons, helpers and laborers on the new works of the Troy, N. Y., Steel and Iron Co., struck on Monday for eight hours with higher wages.

About 150 textile manufacturing firms in Philadelphia are organizing for mutual protection.

Bills presented in the New York Assembly during the week are designed to amend the Penal Code in several particulars, so far as it affects strikers or boycotters in certain cases. Mr. Finn's amendment provides that members of labor organizations shall not be liable to arrest, as they now are, for the doing of acts alleged to be innocent (so far as intent is concerned), in organizing strikes in a peaceful way. Mr. Brennan's amendment prohibits the arrest of "boycotters," and declares that the acts of such persons shall not be deemed a conspiracy or misde-meanor.

William P. Hunt, of the Boston Iron Works, strongly advocates the policy of manufacturing heavy ordnance of cast iron instead of steel, on the ground that for the heaviest guns cast iron is far cheaper, and, on the whole, equally safe and reliable for all except the heaviest strain.

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Special Notices.**Second-hand Machinery for Sale.**

Two Engine Lathes, 87 in. swing, 20 ft. 6 in. bed, Geared in Face Plate, Screw Feed, Compound Rest. One Engine Lathe 36 in. x 20 ft., with raising blocks to raise to 50 in. Good order. One Blaisdell Engine Lathe, 16 in. x 10 ft. Good order. One Enzine Lathe, 15 in. x 6 ft. One Cylinder Boring Lathe, 33 in. x 10 ft. bed. One Planing Machine, 32 x 10 ft. Lathe & Morse make. Good order. One Iron Planer, planes 24 ft. long, 62 in. x 62 in. Excellent condition.

One Iron Planer, planes 8 ft. long, 30 in. x 30 in. Two Iron Planers, planes 6 ft. long, 24 in. wide. Three Iron Planers, plane 4 ft. long, 24 in. x 24 in. Three Iron Planers, plane 5 ft. long, 20 in. x 20 in. One Oliver Bros. & Phillips' Bolt Header. One Four-Spindle Nut Tapper. One 1750-lb. Bement Steam Hammer. Excellent. One Small Steam Hammer. One Dead Stroke Hammer. Good order. One Hydraulic Wheel Press. One 10-inch B. G. S. F. Upright Drill. N. Y. Steam Engine Co.'s make. One 26-inch B. G. S. F. Upright Drill. Two Slotting Machines, 6-in. stroke. Bement's make. One Profiling Machine. One Axle Lathe, for car axles. One Durrell 7 Spindle Nut Tapper. Send for lists New and Second-hand Tools, too long for publication.

Sole Agents EDISON SHAFTING MFG. CO. THE GEO. PLACE MACHINERY CO., 121 Chambers and 103 Beale Streets, NEW YORK.

BARGAINS.

One 26 x 42 in. Hor. Engine, Goodwin Cut-off. One 20 x 48 in. Corliss Engine. One 14 x 20 in. American New York Safety Engine. One 10 x 18 in. Shaper Engine and Boiler. One 6 H.-P. Baxier Engine. One 10 H.-P. Ligerwood Hoisting Engine. One 28-in. swing, 16 ft. bed. Engine Lathe. One 22-in. " 16 ft. " " One 19-in. " 10 ft. " " One 16-in. " 6 ft. " " One 15-in. " 5 ft. " " One 3-Spindle Pratt & Whitney Drill. One 50-in. Boring and Turning Mill. One 20-in. Coleman Drill. New Haven. One 10-in. Steel Engine Co. Comp'd Planer. One 10 H.-P. Marine Boiler. One 60 H.-P. Vertical Boiler. One 60 H.-P. Hor. Tubular Boiler. One 20 H.-P. " " Taber & Morse, on wheels. One 5 H.-P. " " Payne Vertical. One 14-in. Steam Cylinder Worthington Duplex Pump. Write and say what you want I have a large stock, constantly changing.

HENRY I. SNELL
135 North 3d Street, Philadelphia.

E's and B's.

The largest and most reliable stock of Engines and Boilers in America. All sizes and styles, and all made of the very best material at lower prices than common, cheap country-made work can be sold. These Engines are all made interchangeable by special machinery. Agents wanted, and orders from the Trade solicited.

Write for Illustrated Catalogue and particulars.

H. M. SCIPLE,
107 and 109 N. Third St., Philadelphia, Pa.

FOR SALE.

Large lot second-hand Iron Tanks, from 5000 gals. down; all sizes and shapes.

About 625 ft. 4-in. Wrought-Iron Tubes with threads cut in them; good as new.

Lot new gal. Oil Tanks with pumps; all complete.

Lot second-hand Engines and Boilers.

Lot new Boots and Horse Shoes. Wrought and Cast Scrap. Red and Yellow.

BUSSENIUS, CUNLIFFE & CO.

Dealers in Scrap Iron and Old Metals.

12th and Washington ave., Philadelphia.

FOR SALE.

A nearly new four-ton Steam Hammer, in first-class condition. Made by the Morgan & Williams Engineering Co. of Alliance, Ohio. Very best manufacture. Address Worcester STEEL WORKS.

Worcester, Mass.

For Sale.

One of the best located Hardware Stands in the Anthracite Coal Region of Central Pennsylvania. Stock consisting of Hardware, Iron and Steel, Stoves and Tinware, Glass, Paints and Oil; will invoice \$12,000 per month. Located in a town of 6000 inhabitants and splendid country trade. Must sell. Reason, ill-health.

Address "ANTHRACITE,"

Office of The Iron Age, 66 and 68 Duane St., N. Y.

Wanted to Buy.

Old Iron and Steel Wire Rope, Burnt Iron, &c.

Address, stating price, quantity, &c.

SITES, GILL & CO.,

222 and 224 So. Third Street,

Philadelphia, Pa.

TO CAPITALISTS AND MANUFACTURERS.

A rare opportunity to invest about \$50,000 in an established Manufacturing Business where Agricultural and other Implements are made. Located in an extensive Agricultural district in a growing town of California. The business has been running three years; has an eligible site. Land adjoins dept grounds of a prosperous Railroad. Address "CALIFORNIA."

Office of The Iron Age, 66 and 68 Duane St., N. Y.

Wanted.

A good Agent in every city to sell the Alaska Patented Dry Air Refrigerator Address, for Circular and lists, the manufacturers.

THOS. H. MARKS,

260 E. Pratt St., Baltimore, Md.

HOISTING ENGINES.

New 10 H.-P. worm-gearred Hoisting Engines: Steam Cylinder 6 in. bore, 8 in. stroke; geared 16 to 1; Drum 6 in. diameter, 18 in. long. Improved Cone Friction for Hoisting and Lowering. Also 6 in. x 10 in. Williamson Spur-Gear Hoist, with Clutch and Link Motion. Drum 6 in. x 16 in.

A. G. BROOKS,

601 N. Third Street, Phila.

NOTICE.

Large Buyers of Shafting are requested to send specification for special prices.

MERWIN McKAIG,

Cumberland, Md.

Special Notices.**SPECIAL NOTICE TO MANUFACTURERS.****THE CALUMET & CHICAGO CANAL & DOCK CO.,**

The largest land owners at SOUTH CHICAGO and in the Calumet Region, offer on liberal terms

SITES FOR FACTORIES,

Lots or acre property on river and railroad, connecting with the B. & O., Chicago & Atlantic, Chicago & E. Illinois, Chicago, R. I. & P., Chicago & W. Indiana, and Belk Line, Ill. Cent., L. S. & Mich. So., L. N. Albany & Chicago, Mich. Cent., N. Y., Chicago & St. Louis and P., Ft. W. & Chicago Railroads.

Number of passenger trains to and from Chicago to South Chicago daily is about 75 each way.

Also Docks on Calumet River, with its splendid harbor at South Chicago, and the only river property connecting with the Belt Line, which also connects with every R. R. entering Chicago.

Towage One-Half Chicago Rates.

Capital invested at this point alone, \$9,000,000.

In buildings and plants, - 4,100,000.

Value of product last year, - 9,000,000.

Lumber received last year, - 105,000,000 fl.

Among the many large establishments already located are the North Chicago Rolling Mill Co.'s Bessemer Steel Rail Mill, the Calumet Iron and Steel Co.'s Rolling Mill and Nail Manufactury, The Morden Frog and Crossing Works, Chicago Forge and Bolt Works, &c. &c.

MANUFACTURERS, or shippers of **COAL, PIG IRON, IRON ORE, LUMBER, ETC.** also parties who wish to build **GRAIN ELEVATORS** will please correspond with us.

Contractors for River and Harbor Improvements, Dredging Dock and Pier Construction, Pipe Foundations, etc. Estimates on application.

Office, 170 Dearborn Street, Chicago.

Price Books.

LARGE SIZE, 500 Pages, 6 x 9½ in.

Full Leather, each, \$8.00.

POCKET SIZE, 250 Pages, 4 x 7 in.

Full Leather, each, \$4.00.

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Bills can be priced and quotations noted in one-quarter of time required by old classification.

Send for Circulars.

B. Lamberson,
PORTLAND, OREGON.

METALLURGICAL ENGINEERING.

I am prepared to furnish

PLANS, SPECIFICATIONS and ESTIMATES

AND TO

SUPERINTEND THE CONSTRUCTION OF ROLLING MILLS AND MACHINERY, REGENERATIVE GAS FURNACES, TUBE AND PIPE MILLS, ETC., ETC.

I represent the latest improvements in all the above branches.

M. V. SMITH, Metallurgical Engineer,

Rooms 16, 17, and 18 Bissell Block, Pittsburgh, Pa.

BLACK RIVER FALLS,
WISCONSIN

Offers splendid opportunities to parties with capital wishing to engage in manufacturing.

Excellent water-power. Plenty of hard and soft timber.

Rich Iron Mines recently opened. The largest charcoal Iron Furnace in the United States just completed.

Extensive Granite Beds now being developed.

Write to secretary Board of Trade for full information.

FOR SALE.—The property known as the Sterling Chain Works, situated on the north side of Allegheny Street, in the Rock Spring section, N. Y., No. 250, with 1000 square feet of space on the Belt Line Railroad Station. The works are in perfect order for immediate operation, and possess all the machinery requisite for the manufacture of Chain from ¼ inch up to 2½ inches. Facilities for receiving and shipping are admirable. See further particulars apply to

Messrs. JOHN OTTO & SON, Buffalo, N. Y.

Descriptive circular sent on application.

Specialties in Cutlery.

Having unexcelled facilities for manufacturing novelties in Cutlery. Shears, Edge Tools, &c., we solicit correspondence with inventors or any who desire to have these articles manufactured and pushed.

EMPIRE KNIFE CO., West Winona, Conn.

For Sale, Manufacturing Sites on the

PITTSBURGH NATURAL GAS BELT.

250 acres of land on A. V. R. R., one-fourth of a mile beyond Pittsburgh city line. Natural gas has been located on this land by Philadelphia (Westinghouse) Co. A 9 and a 12 foot vein of coal on property. Three-fourths mile of river front. For particulars, address JAS. BOYD, Box 85, Allegheny, Pa., or W. A. HERRON & SONS, No. 60 Fourth avenue, Pittsburgh, Pa.

TO LET, WITH POWER, one or more floors of a two story brick building, 10 x 55 feet situated within seven minutes of freight depot and steamboat wharf.

Address P. O. BOX 5, Bridgeport, Conn.

FOR SALE AT VERY LOW PRICES—Several

new Engine Lathes of 10 in., 18 in., 24 in.

and 28 in. of late design, with great power and all modern improvements. For description and prices, address J. B. REED,

Cairo, Ill.

Wanted.

A good Agent in every city to sell the Alaska Patented Dry Air Refrigerator Address, for Circular and lists, the manufacturers.

THOS. H. MARKS,

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Towage One-Half Chicago Rates.

Capital invested at this point alone, \$9,000,000.

In buildings and plants, - 4,100,000.

Value of product last year, - 9,000,000.</p

Trade Report.

New York Iron Market.

So far as the volume of current transactions is concerned, the New York market has not been so dull for a very long period. In the many lines in which it is the leading market in the whole country hardly a single sale of any consequence has been recorded. In those specialties in which it represents only the dealings based upon the local consumption of its own territory the business has been restricted to the requirements of the hour. It is recognized by all that it would be absolutely useless to attempt to force sales, and we have not heard of a single instance in which the market was put to that test. The crude materials are so well in hand that no decline is to be apprehended, even if the stagnation should continue much longer than it is likely to do, through the prospective early settlement of the troubles which have given rise to it. In Finished Iron the Coal strikes have tended to restrict product, and the enhanced cost of manufacture makes a downward move of values practically impossible. The market has come to a halt, where adverse influences cannot much affect it, except possibly in Steel Rails and probably in Old Material, while any causes contributing to turning buyers from their expectant attitude would be reflected in a tendency to higher prices.

American Pig Iron.—The market has been dull and deliveries are being to some extent postponed, while current sales have dwindled down to a very small volume. There is, however, no pressure to sell. Southern Iron is offering, but not at any concessions which might tempt buyers. We quote for standard brands, tide-water delivery, \$18 @ \$18.50 for No. 1 X Foundry, \$17 @ \$17.50 for No. 2 X Foundry, and \$16 @ \$16.50 for Gray Forge. Outside brands are 50¢ below these quotations.

Scotch Pig.—The market is very quiet. Small lots are going. We quote nominally as follows for small lots: Coltness, \$20 @ \$20.50 to arrive; Gartsherrie, \$19.50 to arrive; Shotts and Langloan, \$20.50 to arrive; Carnbroe and Glengarnock, \$19.50 to arrive; Summerlee, \$20 to arrive; Dalmellington, \$19 to arrive; Eglington, \$18 @ \$18.50 to arrive, and Clyde, \$18.50 @ \$19 to arrive. Concessions are made on 100-ton lots.

Bessemer Pig.—We hear of no business, and quote nominally: Foreign \$18.75 @ \$19, and Domestic \$18 @ \$18.50 at furnace.

Spiegelisen.—The market is entirely nominal at \$25.50 @ \$26, for English 20%.

Bar Iron.—The market is dull and continues in buyers' favor. We quote for delivery here in round lots: Common Iron, 1.65¢ @ 1.70¢; Medium, 1.70¢ @ 1.75¢, and Refined Iron, 1.75¢ @ 1.9¢. Store prices are 1.75¢ @ 1.80¢ for Common, 1.85¢ @ 1.90¢ for Medium, and 1.9¢ @ 2.0¢ for Refined.

Structural Iron.—The subject of interest during the week has been the hearing of expert testimony on the bids for the Harlem bridge. It is believed that the contract may be awarded during the course of this week. We quote for Angles 2¢ @ 2.10¢, delivered, and Tees at 2.35¢ @ 2.40¢, for round lots. Steel Angles are quoted 2.35¢ @ 2.45¢, according to quality. Store quotations remain 2.25¢ @ 2.4¢ for Angles, and 2.6¢ @ 2.7¢ for Tees. American Beams and Channels are 3¢ base from dock for all orders.

Plates.—We quote for round lots: Common or Tank, 2.12½¢ @ 2.20¢; Refined, 2.4¢ @ 2.45¢; Shell, 2.4¢ @ 2.5¢; Flange, 3½¢ @ 3½¢; Extra Flange, 4¢ @ 4½¢. For small lots of Steel Plates the quotations are as follows: Ship, 3¢ on dock; Tank, 2½¢ at mill asked; Boiler, 3½¢; Shell, 3½¢; Flange, 4½¢.

Merchant Steel.—Only a moderate business is being done. There is weakness in Open-Hearth Steel. Quotations for the range from ordinary to good grades are as follows: American Tool Steels, 7½¢ @ 9¢; Tool Steel of special grades and finer qualities, 12¢ @ 20¢; English Tool, 13¢ @ 15½¢; common grades, 7¢ @ 9¢; Crucible Machinery, 4.5¢ @ 6¢; Round and Flat Spring, 2.6¢; Round-Edge Tire, 2.6¢; Square-Edge Tire, 2.9¢; Toe Calk, 2.7¢; Sleigh Shoe, 2.8¢; Open-Hearth Machinery, 2.8¢, and Bessemer Machinery, 2.5¢, with freight allowed.

Steel Wire Rods.—There has been no change. We quote nominally \$39.50 @ \$40.50.

Old Rails.—Not a single transaction is reported. Old Rails are offered in large blocks at \$19, but find no takers.

Steel.—We hear of only one moderate sized lot taken by an Eastern mill during the current week. There is considerable demand for small lots for immediate or summer delivery, which are very difficult to place, since the majority of the Eastern mills find it a difficult matter to make deliveries on their earlier contracts. The chief interest in the trade centers in the 25,000-ton contract for the Atchison, Topeka and Santa Fé, for which a sharp struggle among the Western mills is looked forward to, since it is the first important test in fall and winter work. It is understood that some low bids have been put in, and the market has therefore exhibited a slightly weakening

tendency. There are rumors of sales of Foreign Rails to Southern ports, which, however, it is impossible to trace to any reliable source. The Western Steel Co. have now taken between 35,000 and 40,000 tons.

Scrap.—We hear of no business. The market is weaker. There is some Foreign Scrap coming, the bulk of it being sold previous to arrival. We quote nominally \$19.25 @ \$19.75.

Rail Fastenings.—We quote Spikes, 2.20¢ @ 2.40¢; Angle Fish Bars, 1.7¢ @ 2¢; Bolts and Hexagon Nuts, 2.7¢ @ 3¢.

M. G. A. Evans, representative of the Bethlehem Iron Co., has removed his office to Wall street.

Metal Exchange.

The following transactions are reported:

WEDNESDAY, May 5.

10 tons Tin, spot 20.75¢
5 tons Tin, June 20.75¢

THURSDAY, May 6.

10 tons Tin, June 20.75¢

FRIDAY, May 7.

10 tons Tin, May 20.80¢
10 tons Tin, June 20.75¢

5 tons Tin, spot 20.75¢

10 tons Tin, June 20.80¢
5 tons Tin, May 20.85¢
10 tons Tin, June 20.85¢

SATURDAY, May 8.

5 tons Tin, June 20.85¢
MONDAY, May 10.

5 tons Tin, July 20.85¢
5 tons Tin, August 20.90¢

TUESDAY, May 11.

5 tons Tin, June 21¢
5 tons Tin, spot 21¢

Philadelphia.

Office of *The Iron Age*, 220 South Fourth St., PHILADELPHIA, May 11, 1886.

Pig Iron.—The market has not shown any material change, although it appears to be gradually losing the firm tone that characterized it for some months past. There is very little change in prices, first because there is no demand for large lots, and second because there is very little Iron offered beyond what the present limited demand can absorb. This condition of affairs cannot last much longer, although it by no means follows that prices will decline. The indications favor such a contingency, but there is such a general shaking up that it is hard to predict what course the market will take. Cost of production is increasing, and with the present outlook for labor there is absolutely no chance for reduction; hence lower prices for the product seem to be out of the question. At the same time it will be difficult, and in the long run impossible, to continue a large production and maintain prices without some very decided increase in the demand, but where the demand is to come from in the face of so many lockouts is the most difficult question the trade have to deal with. Undoubtedly the country is in a good condition generally, and if things were settled a large business would be almost a certainty. How much injury has been done and how much will be done before business is allowed to resume its ordinary channel is one of those things that cannot be estimated; hence the universal disposition to neither buy nor sell extensively until things are more settled. The fear is that by the time the labor question is arranged stocks will have accumulated, and with declining prices the market will be so demoralized as to seriously retard business for the balance of the year. Under these conditions it is no wonder that things are dull; the wonder is that the market has been held as well as it has, and, as we said before, the disposition is to wait developments before embarking in any extensive operations. Sales, therefore, have been almost exclusively in small lots, at from \$18.50 to \$19 at tide for No. 1 Foundry; \$17 @ \$17.50 for No. 2, and \$16.50 @ \$16.75 for Gray Forge, with a strong probability that orders for good-sized lots could be placed at concessions. Southern Irons are offered with more freedom, but nothing of any moment has been done, as consumers are not in the market at anything like the price asked, say, \$16 @ \$16.50 for Gray Forge and \$18 @ \$18.50 for No. 1 Foundry, ex-ship Philadelphia.

Foreign Iron.—There is nothing doing, and prices remain as last quoted, viz., \$19.25 for Ordinary Bessemer and \$20 for special brands. Spiegel is quoted \$26 for 20%, but there is no demand.

Blooms.—There is very little doing, and prices are slightly lower; asking rates are as follows: Slabs for Nail Plate, \$30 @ \$31 at tide for Foreign and \$30 at mill for Domestic, and from that to \$35 for higher qualities; special grades for Boiler Plates and other uses requiring high tensile strength, \$36 @ \$39. Other Blooms as follows: Charcoal, \$52 @ \$54; Run-out Anthracite, \$43 @ \$44; Scrap Blooms, \$33 @ \$34, and Ore Blooms, \$34 @ \$35.

Merchant Steel.—Only a moderate business is being done. There is weakness in Open-Hearth Steel. Quotations for the range from ordinary to good grades are as follows: American Tool Steels, 7½¢ @ 9¢; Tool Steel of special grades and finer qualities, 12¢ @ 20¢; English Tool, 13¢ @ 15½¢; common grades, 7¢ @ 9¢; Crucible Machinery, 4.5¢ @ 6¢; Round and Flat Spring, 2.6¢; Round-Edge Tire, 2.6¢; Square-Edge Tire, 2.9¢; Toe Calk, 2.7¢; Sleigh Shoe, 2.8¢; Open-Hearth Machinery, 2.8¢, and Bessemer Machinery, 2.5¢, with freight allowed.

Steel Wire Rods.—There has been no change. We quote nominally \$39.50 @ \$40.50.

Old Rails.—Not a single transaction is reported. Old Rails are offered in large blocks at \$19, but find no takers.

Steel.—We hear of only one moderately sized lot taken by an Eastern mill during the current week. There is considerable demand for small lots for immediate or summer delivery, which are very difficult to place, since the majority of the Eastern mills find it a difficult matter to make deliveries on their earlier contracts. The chief interest in the trade centers in the 25,000-ton contract for the Atchison, Topeka and Santa Fé, for which a sharp struggle among the Western mills is looked forward to, since it is the first important test in fall and winter work. It is understood that some low bids have been put in, and the market has therefore exhibited a slightly weakening

Prices range from 1.7¢ to 1.8¢ for medium quality Bars, 1.82½¢ to 1.9¢ for Best Refined, and 1.82½¢ to 1.85¢ for Skelp.

Plate and Tank Iron.—The demand keeps up very fairly and mills are all well employed with orders extending pretty well to the middle of next month. There are no large orders on the market, and nothing to indicate anything of that kind at present, but the run of small orders is so continuous that manufacturers expect to be kept fully employed and probably at somewhat better prices. The feeling is firm, and full quotations are realized, and in some cases a slight advance asked. We quote about as follows: Ordinary Plate, 2.05¢ @ 2.1¢; Tank, 2.1¢ @ 2.2¢; Shell, 2.5¢; Flange, 3.5¢; Fire-Box, 4.25¢; Steel Plates, Shell, 3.25¢; Flange, 3.5¢; Fire-Box, 4¢.

Structural Iron.—There is very little change to report, either in price or demand. Small lots are steadily called for, and in this way the mills are moderately well employed, but there is nothing heavy, and at present no inquiries likely to lead to anything of that kind. The feeling among manufacturers is not very cheerful, the outlook being, to say the least, very uncertain. Prices are unchanged, and about as follows: 2¢ @ 2.05¢ for Angles; 2.1¢ @ 2.2¢ for Bridge Plate; 2.4¢ @ 2.5¢ for Tees, and 3¢ for Beams and Channels.

Sheet Iron.—The demand has been somewhat disappointing of late and prices not at all what they ought to be, considering the increase in cost of production. Some of the leading mills are either shut down entirely or running short, owing to the limited supply of Coal, which, if continued for any length of time, will probably cause something of a scarcity. Meanwhile prices are held as before, say for the best makes:

Best Refined, Nos. 28, 27 and 28.	4¢
Best Refined, Nos. 18, 20 and 21.	3½¢
C. & L. less than the above.	
Best Bloom Sheets, Nos. 26 to 28.	4½ @ 5¢
Best Bloom Sheets, Nos. 22 to 25.	4½ @ 4½¢
Best Bloom Sheets, Nos. 16 to 21.	3½ @ 4½¢
Blue Annealed.	3½ @ 3¢
Best Bloom, Galvanized, discount.	60¢
Common, discount.	65¢

Steel Rails.—There is not much doing at present, but, as there is an abundance of work on hand, there is not the least pressure to sell. Prices are steady, but not quite as high for small lots as they were a couple of weeks ago. Sales chiefly at \$35 at mill, although buyers could probably do a little better on firm offers for good-sized lots. There is no urgency to place orders, however, as spring and summer requirements appear to be pretty well covered.

Old Rails.—There are sellers at \$21 spot, or \$22 delivered at interior points, but there is absolutely no demand for large lots. The market looks weak, and to effect sales sharp concessions would have to be made.

Scrap Iron.—Demand extremely slow, and prices weak, with a downward tendency. No. 1 Wrought Scrap, \$20 @ \$21; No. 2 do., \$13.50 @ \$14.50; Turnings, \$14 @ \$14.50; Old Car Wheels, \$15 @ \$16; Old Steel Rails, \$20 @ \$22; Fish Plates, \$23.50 @ \$24.50; Cast Scrap, \$14 @ \$15; do. Turnings, \$10 @ \$10.50.

Wrought-Iron Pipe.—There is but little to report in this line except that the demand continues brisk and takes all the stock the mills are able to make. No contracts for the future are solicited, and quotations are given only for prompt delivery. No change in price is reported, but the market is very firm at last week's figures, viz.: Discounts for large lots as follows: Lap-Welded Black, 60%; Butt-Welded Black, 42½%; Butt-Welded Galvanized, 32½%; Lap-Welded Galvanized, 42½%; Boiler Tubes, 55%.

Nails.—The week shows some increase in the aggregate of sales, yet nothing near the quantity that would ordinarily be considered a fair demand for the season. Under these conditions it would seem that for the present sellers should be content to wait for orders rather than attempt to force business.

The latter course results in weakening the market and forcing prices down, for large sales cannot be made except by very free concessions. Already figures have been reached that a few weeks ago would have been thought impossible, and unless the efforts to sell are restrained there is no telling when bottom prices will be touched. For the time quotations are about \$2.30 for small lots at store, with liberal rebates according to quantity and terms.

Hardware.—While here and there we hear complaints that business has fallen off, as compared with a few weeks back, the majority report the demand is keeping up beyond expectation. These reports, of course, are qualified by a consideration of the uncertainty caused by the trouble in labor matters. Orders do not come for large quantities, but frequent calls indicate short stocks among the retail dealers and constant demand from consumers. Prices continue firm, though shading on old stocks is reported once in awhile, but on the whole all recent advances are well maintained.

With reference to Sandpaper, it may be stated that, while jobbers do not complain of the big advance in price, they very strongly denounce as unjust and arbitrary the condition requiring such a large quantity to be purchased in each order that the maximum discount may be secured.

Wood-Working Machinery.—Manufacturers are still quite busy with orders on hand. As reported some time ago, Machines in store were all taken by the general demand, and the constant receipt of orders has prevented any accumulation of new

stock. At present there is some falling off in new business, and only very low prices secure what there is offering. There is, however, considerable work still in process, and a short period of dullness will enable makers to catch up with the back orders.

Pittsburgh.

Office of *The Iron Age*, 77 Fourth Avenue, PITTSBURGH, PA., May 11, 1886.

Trade in all lines continues in an unsettled and unsatisfactory condition, and while the labor troubles continue no important improvement can reasonably be expected. The labor situation in Pittsburgh is becoming more and more complicated.

Among the Iron and Steel workers there is not much trouble, but never before, perhaps, have there been so many idle carpenters, stonemasons, bricklayers, &c.; some of these are demanding increased pay and others shorter hours. The natural result of these strikes is to unsettle everything, and as a consequence there is nothing like the work for builders there was at the same time last year. People who contemplated making improvements have abandoned the idea for this year at least. The weather continues exceedingly favorable for vegetation, and the growing crops never promised better; unless something unforeseen occurs the winter wheat crop in nearly all the winter wheat States will be much larger than that of last year, and the outlook for spring wheat is also equally promising. With the promise of good crops, and the labor troubles disposed of, general business might pick up.

Pig Iron.—The market continues in an unsatisfactory and unsettled condition, and the prospect for an early change for the better is not very encouraging. Production continues large, but little idle furnace capacity here or at tributary points, but as there appears to be little or no accumulation of stock in first hands it is evident that consumption is also large and that the furnaces generally are sold ahead. Demand, however, has fallen off considerably within the past few weeks, and there is not the disposition to contract for forward delivery that was so common some time ago; mill owners, in view of a probable shutdown in July, will buy only as their immediate actual necessities require. Furnace men aver that owing to increased cost of production they will have to advance the price or blow out, while consumers claim that the market for Finished Iron is in worse condition now than it was two months ago, and instead of being willing to pay any additional advance for the raw article they claim that it is now bringing more money relatively than the products. What the outcome will be is pretty hard to foretell at present, but, to say the least, the outlook is not very encouraging. We repeat quotations of a week ago:

Neutral Gray Forge.	\$16.00 @ \$16.50, 4 mos.
All-Ore Mill.	17.50 @ 18.00, 4 "
White and Mottled.	15.25 @ 15.75, 4 "
No. 1 Foundry.	18.00 @ 18.50, 4 "
No. 2 Foundry.	17.00 @ 17.50, 4 "
All-Ore Foundry.	18.50 @ 19.00, 4 "
Charcoal Foundry.	20.00 @ 24.00, 4 "
Cold-Blast Charcoal.	25.00 @ 27.00, 4 "
Bessemer Iron.	19.00 @ 19.50, 4 "

Bessemer Iron continues dull, and we hear that offers have been made recently to sell large blocks at \$10, four months; small

inducement to some country buyers, and more sales in this quantity are reported than for several weeks previous. These shipments have been made principally from mill, and range in price from \$2.15 to \$2.20, 2% 60 days, for Iron Nails. From store jobbers quote \$2.25 @ \$2.30 in small lots. On Steel Nails jobbers quote \$2.50 in small lots, and vary in price for carloads from this figure to \$2.45, 2% 60 days. It is said that the majority of Nails now sold in this market are of Western manufacture, which has caused Eastern makers to cut prices to abnormally low figures. The fact that nearly all building operations are temporarily suspended leaves very little hope of a revival in price or demand this season.

American Pig Iron.—The market for the week, however surprising it may seem, showed some improvement in the demand from country buyers. Small towns located at a distance from cities have not been seriously affected by the troubles that have been experienced in Chicago, Milwaukee, St. Louis and other large manufacturing centers. Foundrymen in these small country places readily see that when business in large cities is suspended their chances of work are greatly increased. Quite a number of them are taking advantage of the situation and are buying small stocks of Iron to meet the demand that they feel sure will come as a matter of necessity in some lines of trade. They are not buying in large lots, and 50 to 100 tons are considered a very nice order. Carloads are more frequent. Sales agents continue to quote \$20.50 @ \$21 for Nos. 1, 2 and 3 Lake Superior Charcoal, and the same figure will likely take all numbers. There appears to be a surplus of No. 6, which some furnacemen would sell at less than No. 1. Coke Irons are still quoted \$10.50 for No. 1, and \$18.50 @ \$19 for No. 2, but the low price at which Southern Iron has been sold recently in this vicinity puts these figures so far out of range that sales could not be made if a sufficient quantity of Southern Iron can be brought here. On a sale of Southern Mill Iron which has just come to light prices were made which would be equivalent to \$16.50, cash, for No. 2 Foundry, Chicago delivery. Ohio Standard Blackband Irons remain fairly firm at \$20 @ \$21 for the best grades. No sales of Cinder Mixed are reported, and prices are nominally from \$18 to \$19, as heretofore. The immediate outlook in the Pig-Iron market depends very much on the action of the foundrymen, who at the present time are nearly all closed. A strong organization has been effected in this city, which has in the neighborhood of 100 signers, who are determined to obtain 10 hours work per day. In this movement it is understood that they are seconded by many of the foundrymen in the suburban territory, and any movement on the part of the laboring men will be met by the entire trade as though it were one concern. We hear of but three of the larger ones that are running, and these are under a special agreement to get out orders under contract.

Merchant Steel.—Jobbers report that there is no city trade whatever, and very few orders coming in from the country. What little trade they do have is for repair work in country machine shops or from the Agricultural Implement makers, but this amounts to so small an aggregate that it is not regarded as worth mentioning. There is no change in prices as heretofore given.

Steel Rails.—Both mills in this city have been kept in operation during the week on orders in hand. Very little new business has been placed, though railroads have made some inquiries for stock to be delivered late in the fall, providing business operations again assume their normal conditions. Prices are nominally \$38 for first quality and \$34.50 for second quality, as heretofore.

Bar Iron.—There has been no trading in Bar Iron among city buyers during the week beyond the Bar or bundle lot. From the country the small-lot trade has been carried on, but shipments could not be made until the latter part of the week. Jobbers report that they have numerous communications regarding contracts for new work that have been canceled, and they feel that the worst feature of their business has not yet come upon them. Specifications for black-cessary ordered.

Railroad Supplies.—For the past few months the mills have been kept busy on these articles; in fact, such has been the demand that several large contracts for Spikes and Plate have gone North. Light Rails, from 8 lb to 30 lb, have been in good demand in making short lines to sawmills and Coal and Ore mines. The lighter generally have been made at home, while the heavier have mostly been purchased in Pennsylvania.

Miscellaneous.—The question of the manufacture of Steel in the South has been agitated considerably, but, with the exception of the experiment at the South Tredegar, in this city, has not as yet taken shape. There can be no question of the availability of the Cranberry Ores for Steel, as their analysis shows the presence of what is required and the absence of what would condemn them, but with the exception of these Ores the question is a mooted one as to there being any other Ores in the South in sufficient abundance to make Steel-making a practical thing under any of the processes that are now known.

for further developments. Makers and dealers in Beams have lots piled up in their yards which should have been delivered weeks ago. The buildings in many cases have been abandoned temporarily, and in some instances notices have been served that the material will not be required this season.

Black Sheets.—Makers of Black Sheets are still offering concessions to jobbers for stock delivered previous to July 1. Nos sales of importance are reported, and jobbers quote on Sheets, from store, No. 24, 2.80¢; Nos. 25 and 26, 2.90¢; No. 27, 3¢.

Galvanized Iron.—From store jobbers report very little doing, and quote 60 and 5% off on Juniata and 60 and 10 and 5% off on Charcoal.

Scrap Iron.—The conditions of the Scrap market are decidedly unsatisfactory. There is plenty of stock offering, but dealers are afraid to purchase in the present condition of trade. No. 1 Wrought is quoted at figures ranging from \$17 to \$18, No. 1 Mill at \$13.50 and No. 2 at \$8.50. On other articles of Scrap the nominal prices heretofore given remain unchanged.

Pig Lead.—Trading in Pig Lead in the last several weeks has been very light. Dealers are not inclined to place orders for immediate or future use, and figures are consequently weak. Sales of several hundred tons have been made in the last two weeks at prices ranging from 4.60¢ to 4.70¢, the lower figure being about that quoted on the market at the present time. It is said that the offerings of Lead are not large, yet withal sufficient to meet all demands.

Chattanooga.

Office of *The Iron Age*, Carter and Ninth Streets, Chattanooga, May 10, 1886.

Taking into consideration the labor disturbances of the Northwest, general business holds up remarkably well in nearly all mercantile and manufacturing lines. The railroad lines leading from all the business centers of the South appear to have taken in the situation fully, and hardly an instance can be cited where a market has been cut off at any one point but what some other market is at once opened to the manufacturer at rates entirely within his reach. The near approach of the time when the gauges of all the roads, both North and South, will be the same is looked upon as a very advantageous event in facilitating the movements of all Southern products into the Northern markets. The crops all over the South, although somewhat backward, are looking well.

Pig Iron.—It is almost impossible to correctly describe the present condition of the market. It is useless to deny that prices have taken a considerable decline, and new transactions are made at a concession of about \$1 @ \$1.50 per ton on the figures ruling some weeks since, and then again in the face of a decrease of consumption there is ahead the prospect of an increased product. Nearly all the Southern furnace plants have increased their output from 10 to 50%, and the present year will probably see not less than four of the largest-sized stacks blown in on Coke Iron. In addition a new 50-ton Charcoal furnace at Etna in Middle-town, and one at Goodrich of the same capacity, will soon be ready. Movements are also numerous in other sections toward putting up new furnaces, but as yet have not taken definite shape. Shipments to Eastern points have increased largely of late, and the present month will probably see double the amount taken to New York, Boston and Philadelphia.

Lumber.—A few large orders for Car Lumber have been countermanded, but the amount required for other purposes keeps the mills well supplied with orders. The home consumption of Lumber has increased very much since the first of the year.

Railroad Supplies.—For the past few months the mills have been kept busy on these articles; in fact, such has been the demand that several large contracts for Spikes and Plate have gone North. Light Rails, from 8 lb to 30 lb, have been in good demand in making short lines to sawmills and Coal and Ore mines. The lighter generally have been made at home, while the heavier have mostly been purchased in Pennsylvania.

Miscellaneous.—The question of the manufacture of Steel in the South has been agitated considerably, but, with the exception of the experiment at the South Tredegar, in this city, has not as yet taken shape. There can be no question of the availability of the Cranberry Ores for Steel, as their analysis shows the presence of what is required and the absence of what would condemn them, but with the exception of these Ores the question is a mooted one as to there being any other Ores in the South in sufficient abundance to make Steel-making a practical thing under any of the processes that are now known.

Cincinnati.

MAY 10, 1886.

Pig Iron.—Quotations of offers and sales in the past week, f.o.b. cars, Cincinnati, or less the freight to Cincinnati, when orders are filled directly from furnaces: Charcoal

Furnace, Hanging Rock, No. 1, \$21; No. 2, \$19 @ \$20; Southern Tennessee, Alabama and Georgia, No. 1, \$18 @ \$19; No. 2, \$1 less. Coke Foundry, Ohio, West Pennsylvania and Alabama and Tennessee, No. 1, \$17 @ \$19.50, four months; No. 2, 50¢ @ \$1 for

ton less; all the grades needed by consumers can be readily had, and prices, it is reported, are in favor of consumers. Silver Gray Softeners, Hanging Rock, \$17.50 @ \$19 for No. 1; No. 2, 50¢ @ \$1 less; no quotable price for lower grades. Car-Wheel, the range of grades and their prices is from \$1 to \$27, including Cold, Warm and Hot-Blast kinds; no sales reported, but negotiations are still offering concessions to jobbers for stock delivered previous to July 1. Nos sales of importance are reported, and jobbers quote on Sheets, from store, No. 24, 2.80¢; Nos. 25 and 26, 2.90¢; No. 27, 3¢.

Galvanized Iron.—From store jobbers report very little doing, and quote 60 and 5% off on Juniata and 60 and 10 and 5% off on Charcoal.

Scrap Iron.—No activity or depression reported; dealers say "prices are firm and waiting for business."

The Iron interests here, and every other item on the list, are still offering concessions to jobbers for stock delivered previous to July 1. Nos sales of importance are reported, and jobbers quote on Sheets, from store, No. 24, 2.80¢; Nos. 25 and 26, 2.90¢; No. 27, 3¢.

Black Sheets.—Makers of Black Sheets are still offering concessions to jobbers for stock delivered previous to July 1. Nos sales of importance are reported, and jobbers quote on Sheets, from store, No. 24, 2.80¢; Nos. 25 and 26, 2.90¢; No. 27, 3¢.

Galvanized Iron.—From store jobbers report very little doing, and quote 60 and 5% off on Juniata and 60 and 10 and 5% off on Charcoal.

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Pig Lead.—Trading in Pig Lead in the last several weeks has been very light. Dealers are not inclined to place orders for immediate or future use, and figures are consequently weak. Sales of several hundred tons have been made in the last two weeks at prices ranging from 4.60¢ to 4.70¢, the lower figure being about that quoted on the market at the present time. It is said that the offerings of Lead are not large, yet withal sufficient to meet all demands.

Birmingham.

BIRMINGHAM, ALA., May 10, 1886.

In so far as business is dependent upon the course of the seasons it is as good throughout this region of the country as could reasonably be expected. The tendency of things is entirely satisfactory. More business has been done in the last few days than at any other time since winter. Locally, one of the most conspicuous signs of prosperity is a serious scarcity of labor. Railroad building and certain manufacturing lines are finding this keenly.

Pig Iron.—The general condition of the Iron trade is not what manufacturers would have it, by any means, and furnacemen feel that they have especially little to be grateful for. The uncertainty and timidity of business North and West continue to bear upon them heavily. Inadequacy of transportation facilities continues to fill the yards with Iron that ought to have been delivered before now. The volume of production keeps well up to the high figures of the last few months. Last month's output of the two Sloss furnaces, being 5365 tons, was the largest ever made by one concern in this district. Following are some of the freight rates made by the recent 15¢ reduction: Chicago, \$4.35; Cincinnati, \$3.25; St. Louis, \$3.60; Kansas City, \$6; St. Paul, \$6.13; Detroit, \$4.35.

Finished Iron.—The business that comes here in this line from the West is now about what it was before the strikes. Some of the best patronage comes from districts in the Southwest which had the good fortune to escape the labor troubles, and which therefore have no general cause for withholding orders. In the absence of better prices the mills here get some comfort out of a steady, if not very rapid, extension of territory. One of their recent sales of considerable bulk was to a Pacific Slope point.

Miscellaneous.—Among the best jobs booked at the foundries and shops in the last week are an Iron bridge at one place

for Lafayette County, Ga., and a molding machine at another for Huntingdon, W. Va., the former being a triumph of the Southern Bridge Works over a number of Northern competitors. Smaller work is abundant. The railroads are now crowding all the shops with their preparations for a change of gauge.

Coal.—The dull half of the year for fuels is just opening, but the condition of the Coal market is rather better than it has been for the last month or two. Considerable reductions of price usually begin about now, but this time the operators as a rule are not making concessions. One has raised prices, indeed. Resumption of work in some Southern cotton mills has brought business to some small Steam Coal concerns about here and enabled them to resume. Some

large contracts have already been made for Domestic Coal, to be supplied during the summer for next winter's trade. The usual summer reduction of freight rates went into effect the 1st day of this month, being from 40¢ per ton down. Montgomey, about 100 miles distant, will pay \$1.25 per ton until the 1st of October, and Nashville, 200 miles away, \$1.50. Of the few important markets which have the same rates winter and summer Mobile and New Orleans pay \$2, and \$1.50 for second quality, as heretofore.

Merchant Steel.—Jobbers report that there is no city trade whatever, and very few orders coming in from the country. What little trade they do have is for repair work in country machine shops or from the Agricultural Implement makers, but this amounts to so small an aggregate that it is not regarded as worth mentioning. There is no change in prices as heretofore given.

Steel Rails.—Both mills in this city have been kept in operation during the week on orders in hand. Very little new business has been placed, though railroads have made some inquiries for stock to be delivered late in the fall, providing business operations again assume their normal conditions. Prices are nominally \$38 for first quality and \$34.50 for second quality, as heretofore.

Bar Iron.—There has been no trading in Bar Iron among city buyers during the week beyond the Bar or bundle lot. From the country the small-lot trade has been carried on, but shipments could not be made until the latter part of the week. Jobbers report that they have numerous communications regarding contracts for new work that have been canceled, and they feel that the worst feature of their business has not yet come upon them. Specifications for black-cessary ordered.

Railroad Supplies.—For the past few months the mills have been kept busy on these articles; in fact, such has been the demand that several large contracts for Spikes and Plate have gone North. Light Rails, from 8 lb to 30 lb, have been in good demand in making short lines to sawmills and Coal and Ore mines. The lighter generally have been made at home, while the heavier have mostly been purchased in Pennsylvania.

Miscellaneous.—The question of the manufacture of Steel in the South has been agitated considerably, but, with the exception of the experiment at the South Tredegar, in this city, has not as yet taken shape. There can be no question of the availability of the Cranberry Ores for Steel, as their analysis shows the presence of what is required and the absence of what would condemn them, but with the exception of these Ores the question is a mooted one as to there being any other Ores in the South in sufficient abundance to make Steel-making a practical thing under any of the processes that are now known.

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Miscellaneous.—The question of the manufacture of Steel in the South has been agitated considerably, but, with the exception of the experiment at the South Tredegar, in this city, has not as yet taken shape. There can be no question of the availability of the Cranberry Ores for Steel, as their analysis shows the presence of what is required and the absence of what would condemn them, but with the exception of these Ores the question is a mooted one as to there being any other Ores in the South in sufficient abundance to make Steel-making a practical thing under any of the processes that are now known.

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Trade Report.

General Hardware.

Trade continues to feel the depressing effect of strikes, disturbances and existing agitations in connection with labor questions, and there has been of late an unusually light business for this season of the year. There is, however, a considerable volume of trade doing in a small way, and prices are in most lines firmly maintained. Manufacturers are indisposed to offer special inducements in the present condition of things, and are also pursuing a conservative course in avoiding the accumulation of stock. Many of them are to a greater or less extent reducing their production, some of them on account of unadjusted labor difficulties, and others from their unwillingness in the present uncertain condition of things to make goods in excess of the wants of the trade. There is, however, a general hope that the present unsettled state of trade is only temporary, and that there will be before long a recovery, when business will resume its normal course and volume.

NAILS.

Efforts to force sales on the part of weak holders, and the determination of other sellers to hold trade jeopardized, have led to a decline for carload lots of Iron Nails to \$2 @ \$2.10. The Eastern mills have been invading the Western markets heavily, and after selling freely there, and in Baltimore and Western New York, at low prices, are competing sharply for the local trade. Store prices are less effected, and remain \$2.15 @ \$2.20 for Iron Nails.

A meeting of Eastern manufacturers is to be held in this city to-morrow, Thursday.

BARE WIRE.

The local market for Barb Wire is weak, carload lots being quoted, with little business doing, at 4.29 1/2 to 4.30 cents for carload lots of Four-Point Galvanized Barb Wire.

MISCELLANEOUS PRICES.

Montgomery & Co., 105 Fulton street, New York, send out the following supplementary notice, May 4, referring to their agency for H. H. Barton, manufacturer of Sand Paper. They say: "Since sending out our circular of the 1st inst., we have had an interview with H. H. Barton, and find that as agents for him we would be restricted to combination prices. We have therefore given up the agency, and instead have purchased a large quantity of his Sand and Emery Paper, Emery Cloth, &c."

The manufacturers of Scythes are adhering strictly to the prices agreed upon, but it is apprehended that there will be some irregularity in the prices at which the jobbers will market the goods. The large orders which were booked by several of the leading houses previous to the new prices are already causing some irregularity, and consciousness in price are being made.

The manufacturers of Sand Paper are having some annoyance from the fact that the jobbers are showing a disposition to sell the goods at irregular prices in order to entice them to purchase and dispose of quantities which entitle them to the large discounts. It is apprehended that the current price will be considerably lower than the manufacturers' price for small quantities, discount 20 per cent. A good deal of dissatisfaction is also expressed by the large jobbers because of the strictness with which the scheme of quantity discounts is adhered to. It is objected that it is a hardship after a large quantity has been purchased at the low figure to be obliged to sort up at the much higher figure which the subsequent order is entitled to.

Copper Rivets and Burrs are held by most of the manufacturers firmly at advanced prices, but some of them are selling at considerably lower figures than others. The market price is, however, governed by the fact that the large jobbers, and the trade generally throughout the country, have large stocks on hand which were purchased when the goods were very low.

The prices on Coil Chain are well sustained, and have in some cases been slightly advanced.

The Norwich Lock Mfg. Co., Norwich, Conn., have discontinued the stamp "Conn. Shear Co." and are closing out their stock of about 1200 dozen Steel-laid Shears so stamped, on which they are offering inducements in price. They have also a quantity of 9-inch Excelsior Shears, full nickel-plated, on which they are also making special terms.

The Superior Wringer, made by the Bailey Wringing Machine Co., Woonsocket, R. I., of which we give a description among our Hardware Novelties on page 33, is sold at \$2 per doz.

Tinware is weak and irregular, in sympathy with the decline in Tin. Net prices representing varying discounts are usually made to large buyers, and when the base discount of 30 per cent. is adhered to extras are freely given, even on small purchases.

The following is the list, May 1, of the Hugunin Improved Adjustable Screw Sash Balances, manufactured by Robert B. Hugunin, Hartford, Conn. Of these it will be seen that three sizes are made of each, Gray and Malleable Iron, the goods having

the new Rocking Hinge and Clamping Brace improvements. The list prices are subject to a discount of 33 1/3 per cent:

Set of 4, Gray, with Screws.			
No.	Dimensions.	Capacity.	Price.
3	4 1/2 x 7 1/2 inches	14 lbs. and under	\$0.68
2	4 1/2 x 1 1/2 inches	16 lbs. and under	.85
1	4 1/2 x 1 1/2 inches	20 lbs. and under	1.06

Set of 4, Malleable.			
No.	Dimensions.	Capacity.	Price.
3	4 1/2 x 7 1/2 inches	16 lbs. and under	\$0.80
2	4 1/2 x 1 1/2 inches	20 lbs. and under	.90
1	4 1/2 x 1 1/2 inches	30 lbs. and under	1.25

The above prices are for plain goods; Hard Bronzed Finished, 10 per cent. extra.

The following are the reduced list prices on the Hasp Locks and Drawer Pulls of the Stoddard Lock and Mfg. Co., Saybrook, Conn., to which we referred in our last issue, and on which is made a discount of 30 per cent:

No.	Dimensions.	Capacity.	Price.
1	4 1/2 x 7 1/2 inches	14 lbs. and under	\$0.68
2	4 1/2 x 1 1/2 inches	16 lbs. and under	.85
3	4 1/2 x 1 1/2 inches	20 lbs. and under	1.06

The discount on their Eureka Padlocks is now 40 per cent.

The following is the list of Mibill's Self-Locking Hasp Lock and Hook, which is manufactured by the Eagle Lock Co., Terryville, Conn., and 98 Chambers street, New York, the list prices being subject to a discount of 40 and 2 per cent. for cash:

No.	Dimensions.	Capacity.	Price.
1	6 inch Iron	.....	\$4.50
2	6 inch All Brass	.....	7.00
3	8 inch Iron	.....	6.00
4	8 inch All Brass	.....	10.00

W. BINGHAM & CO.,

Cleveland, Ohio, are issuing an illustrated and descriptive catalogue of Hardware, Table and Pocket Cutlery, Railway, Miners', Engineers', Architects', Machinists' and Tinner's Tools and Supplies, which will take its place at once as an exceptionally complete, well-arranged and serviceable book. It may be considered as divided into three parts, the first 440 pages being devoted entirely to Tools and Supplies, and which, as containing many goods used by manufacturers, is also issued separately for distribution among them. The body of the catalogue is devoted to a general line of Building and Shelf Hardware and Table and Pocket Cutlery, while the last portion of about 200 pages is occupied by a display of goods especially adapted for the Tin and Stove trade, and which, for distribution to this class of merchants, is also issued in a separate volume. The whole makes an imposing catalogue of nearly 1400 pages, and with the exception of that of the Simmons Hardware Co. is probably the largest and most complete of the many admirable catalogues which are at the service of the trade. It is fully illustrated, and the list prices in nearly all cases are given. We observe that in addition to the standard goods which are represented in its pages a number of novelties are displayed. It is stated in the introductory address to the trade that the time necessary to complete such a volume is so long that many changes in list have taken place since the first pages were printed, but that these have been corrected up to the time of issue. It is intended to announce such changes as may take place from time to time, as well as the addition of new goods. A discount sheet applying to the catalogue is in the press and will soon be issued, and as relating to such an extended line of goods will be regarded with especial interest. We are gratified that the enterprise and prosperity of the well-known house issuing this valuable compendium of Hardware are evidenced in a manner so serviceable to the trade.

ITEMS.

We regret to be called upon to announce, after an illness of more than six months, the death of R. W. Wheeler, who was widely known to the trade as the New York representative of the Union Mfg. Co., 103 Chambers street. Mr. Wheeler, who was in his 47th year, was universally esteemed by those who knew him, on account of his integrity, business efficiency and the personal qualities which commanded the esteem and affection of his many friends.

The Waterbury Brass Co., 296 Broadway, New York, have been appointed sole agents of the American Buckle and Cartridge Co., West Haven, Conn., to whose line of Brass and Paper Shot Shells they call attention. They announce the withdrawal of previous quotations, and state that the goods have recently been much improved in quality, and are now of good value in the several grades.

The trade will not overlook the announcement on page 20 of the coming sale of Tacks by Haydock & Bissell, 12 Murray street and 15 Park place, New York, on account of the Central Mfg. Co., Boston. The large amount of goods offered and the present condition of the market make this sale worthy the attention of Hardware men. The sale takes place Tuesday and Wednesday of next week. Those who cannot attend it can obtain catalogues and authorize the purchase of goods on their account.

Greene, Tweed & Co., manufacturers and importers of Railroad, Mill and Manufacturers' Supplies, have removed from No. 118 to No. 83 Chambers street.

The Hoff, Renner & Adam Mfg. Co., Cincinnati, Ohio, have appointed O. S. Chamberlain as general Western agent for their goods, with office at 51 Dearborn street, Chicago.

Our readers will observe among the Special Notices on page 20, one signed "Agricultural Implements," in which a gentleman

of experience in the Agricultural Implement business, and of wide acquaintance in the trade, expresses his desire for agencies in this line.

The Norfolk Shear Co., Norfolk, Conn., have recently changed the style and finish of their Shears, the Heinrich pattern having been adopted. This line of goods will hereafter be made by them with special attention to quality and will be stamped "Norfolk Warranted."

The Bridgeport Gun Implement Co., Bridgeport, Conn., and 17 Maiden lane, New York, expect to add, July 1, the following sizes of their Forstner Auger Bit to those which they have heretofore manufactured. The new sizes will be listed as follows, the discount being, as announced last week, 10 per cent:

No.	Dimensions.	Capacity.	Price.
1	4 1/2 x 7 1/2 inches	14 lbs. and under	\$0.68
2	4 1/2 x 1 1/2 inches	16 lbs. and under	.85
3	4 1/2 x 1 1/2 inches	20 lbs. and under	1.06

H. W. Hill & Co., Decatur, Ill., call attention to a recent decision of the United States Circuit Court sustaining Mr. Hill's patent on Hog Rings, and enjoining the defendants in the suit from manufacturing and selling the Rings in question, which the court held to be an infringement upon the plaintiff's patent.

Charles B. Clow & Son, Lake and Franklin streets, Chicago, Ill., announce, May 1, that they are now ready to serve their friends and patrons in the new store which they have recently erected. They refer to the completeness of their stock and their greatly increased facilities for transacting their business.

Silver & Co., manufacturers of Household and Sporting Specialties, have removed from No. 41 Broadway to No. 56 Warren street, New York.

Williams & White have removed their office and warehouse to their factory, corner Flushing and Nostrand avenues, Brooklyn, where they will carry a full stock of the Hardware of their manufacture.

The catalogue of Haff & Co., Hartford, Conn., illustrates some of the leading specialties which they are selling, among which are the Perfection Suspension Hook, Handy Broom Holder and other articles.

The Ney Mfg. Co., Canton, Ohio, issue circulars describing their American Sickle Edge Hay Knife, Gas Pipe Jockey Stick, Ney's patent Double-Bar Single Harpoon Hay Fork, and Ney's patent Double Harpoon Horse Hay Fork. On the latter article it is intimated that reduced prices will be made on application. They also call special attention to their Automatic Lawn Rake, which has been represented in our advertising columns.

The Victor Mower Co., Niverville, N. Y., issue striking lithographs illustrating the appearance and operation of the Victor Mower.

The Manufacturers' Association of Brass and Iron, Steam, Gas and Water Works, representing 98 per cent. of the manufacturers in this line of goods in the United States, met at Pittsburgh on Tuesday. It is reported that they unanimously resolved that hereafter ten hours should constitute a day's work for their employees, who would also be allowed five hours each weekly for moral, social and physical improvement.

The Yale Caster Co., New Haven, Conn., issue a condensed new list of their Yale Casters, in which only one change is made from the old list, namely, Size 50 is changed from \$10 to \$12 per dozen. The new list of their Gem Casters is given, the old list having been simplified by dropping some of the superfluous figures. They also announce that they have made arrangements with the Nashua Lock Co., of 36 Pearl street, Boston, and 148 Lake street, Chicago, for the exclusive agency of their goods in the Eastern States, and Michigan, Indiana and Western States, to whom all communications from the above-named territory in reference to their goods should be sent. At the Boston and Chicago addresses given above a full line of goods will be carried in quantities to promptly fill all orders, on which the lowest market prices are authorized.

Otis Brothers & Co., manufacturers of Elevators and Hoisting Machines, have removed their general offices from 92 Liberty street to 37 Park Row (Potter Building), where they will have the more commodious quarters required by their increasing business.

The Pope Mfg. Co., Boston, Mass., issue an interesting and quite unique pamphlet relating to their Columbian Bicycles, having the appearance of a scrap book with clippings from many papers. Upon the covers are fac-similes of the covers or front pages of many American publications, and inside are 200 or 300 extracts relating to Bicycles and bicycling, taken from leading journals and magazines. By the arrangements of tint and type the selections have the appearance of pasted scraps. The pamphlet will be of service in calling attention to the Bicycles to which it refers, as it will certainly be of interest to those who receive it.

WHAT THE TRADE SAY.

Edwin Hunt's Sons, Chicago, Ill., issued May 1 a 16-page Hardware circular devoted largely to seasonable specialties. It refers to Spring Hinges, Screen Doors, Wheelbarrows, Scythes, Shovels and other goods, which are illustrated in most cases without quotations or list prices. It opens with the following review of the market, which will be of interest:

Values in most lines are admittedly low and margins small. Notwithstanding savage

cutting in certain leading articles, goods cannot as a rule be bought at prices made four months ago. Increased wages have caused some advances, but these have been rather of necessity than the result of any buoyant tendency. All goods are in good supply; even Nails seem to be entirely independent of the large number of machines idle since last June, and it would be difficult to say what the effect upon the market would be if their immense capacity should be restored by amicable arrangement with operatives; the condition of the Tack market may furnish some indication.

The Lead market is controlled by a few large operators, and until they have disposed of their holdings the price of this metal and products may be expected to rule high. Shot is an exception, owing to war among the manufacturers. Copper goods, Sheathing and Bottoms are firm at the prices established in February. Sand Paper advanced April 10. We see no reason why the season should not be a favorable one from a business point of view, unless indebtedness among the farming population, on whom we all depend, is much more general than has been supposed. However this may be, we have never been in better position to take care of such orders as may be intrusted to us, and we shall be pleased to hear early and often from all who need our goods, whether we have heretofore had the pleasure of numbering them among our customers.

A correspondent in Hartford, Conn., inquires in facetious vein in regard to the spelling of the word Manila, as it is printed in these columns, or Manilla, as Webster is referred to as giving it. It is, however, hardly fair to hold the great lexicographer responsible for the latter form, which was not given in the earlier editions of the dictionary, but is a comparatively recent and incorrect modification. The word in question, as a geographical name, is Spanish, and has only one l. If it were Manilla it would in that language have a different pronunciation.

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We occasionally receive anonymous communications in regard to trade topics which we cannot use or consider, inasmuch as we are unable to judge whether or not they are sent in good faith and by responsible parties. We have in hand a letter purporting to come from Cincinnati

The following partial description of the store of the Francis T. Witte Hardware Co., 106 Chambers street, New York, with special reference to some of the methods adopted, will doubtless be of service. In this store a wholesale and retail business is carried on, and an effective display of goods is combined with a remarkable economy of space and

care for long tools, such as Augers, Chisels, Screw Drivers, Wrenches and the like, a difficulty which this arrangement seems to have satisfactorily met. The bins described conveniently hold the goods whose samples the sloping lids effectively display. The front of the bin can also be used for samples. The deep shelves in the ledge are for heavy goods, like Strap and T Hinges, &c. Each

separate hole. The Saws not called for so often are put higher up, and two or three points together. The Rack will hold a great variety, and when kept in shape presents a very handsome appearance. Of course each pigeon-hole is distinctly lettered with black letters on white paper, and printed, not written. A lot of these labels can be printed at once and renewed when they become soiled. As the Rack extends out so much further than the shelving, we have placed it in the back part of the store. In some stores it could no doubt be given a more central position without detracting from the appearance. Smaller stocks could, we need scarcely say, be accommodated in a smaller rack. In connection with our Saw Rack, as represented in the cut, we have pigeon-holes of the same depth, 10 inches wide and 12 inches high, for Axe, Adze, Sledge and Pick Handles, D Handles, Handled Axes, Yard Sticks and other uncomfortable goods.

Another Nail Counter which, it will be perceived, is entirely different from anything that we have described, is illustrated in the accompanying illustration, for which we are indebted to a Missouri Hardwareman. The cut indicates the general arrangement, method of operation and measurements, and with the following description our correspondent's suggestion will be of service to our readers:

Boxes of receptacles for Nails are set in the Counter, as shown in Fig. 89, the dimensions of which are there given. These boxes swing outward on $\frac{1}{2}$ -inch iron rod, 5 inches from the bottom. This rod rests in notches on the inside of the partition posts, which are made of 2×4 inch wood. Each

ranged on stationary platforms about 10 or 12 inches high, starting about 10 or 12 feet from the front and running to the back. There are three rows of platforms, one against each wall and one in the center. Ranges and square stoves occupy the outside platforms, and smaller sizes the center, the largest stoves being placed in front. The platforms are painted a light brown. The shelving is all supported on iron brackets, there being three shelves on each side of the house, they being about 20 inches wide and about 18 inches apart, the lower shelf being about 5 feet from the floor. The back end of one side platform has a rich-looking oil cloth on it, and is devoted to mantels, this being directly under the skylight, the office occupying the other back corner of the room. I speak of the room being inconvenient. It has only one show window, a very large stairway cutting one corner of the room, it opening on the street, and leav-

ing close, and for cash, and of making quick sales at small profits and for cash:

If he buys for cash he buys well, and if he sells for cash he sells better. These he must do, for cash is king nowadays, and no business which is run on a credit basis can hope to compete successfully with another on a cash basis. The draper's principle of small profits is a good one. It keeps the money moving, prevents the accumulation of old and unsaleable stock, keeps the stock up to the current fashions and fancies, enlarges the circle of buyers enormously, and, in brief, pays those who adopt it. Some ironmongers take a great deal of convincing on this head. They "do not believe" in these new-fangled ways. They like a big and good stock of goods, and they cannot see how any business can pay where the profits charged on individual articles are less than 50 or, may be, even 100 per cent. They do

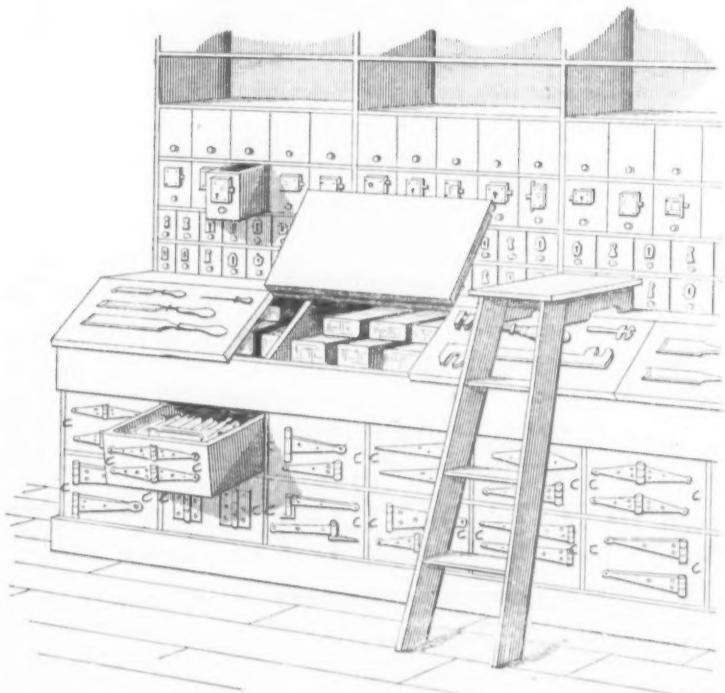


Fig. 84.—Ledge, Shelving, Ladder, &c.

convenience of handling. With the following description, and the cuts which are given below, our readers will be able to appreciate some of the methods employed:

The entire left side of the main floor consists of uniform shelving, except the section furthest to the rear, where the office is located. The accompanying cut (Fig. 84)

division of these shelves is fitted with two cases or drawers on rollers—a convenient arrangement if the space is needed at any time for lighter goods. The stock in the department illustrated in the cut consists mostly of Builders' Hardware, the first section of the shelf boxes being occupied by Door Locks and Knobs. In the two under shelves in the smaller boxes are Escutcheons and the smaller Lock Furniture. Then follow down the length of the store Gong Bells, Screw Hooks and Eyes, Cabinet and Trunk Locks, Coat and Hat Hooks, &c. The boxes are covered with canary-colored paper. The effect is pleasing, and the paper seems especially adapted as a background for the goods.

An effective method of sampling the goods contained in the boxes and the shelves is represented in Fig. 85, which shows a light sample board 15 or 18 inches in length, which is attached, as indicated, to one of the upright divisions in the shelving. Its advantages are that, swinging freely, it is never in the way, that it can be removed for close inspection of the goods, and makes an effective display. Both sides are used for samples.

The upper boxes are reached by the light step ladder similar to the one shown in the cut Fig. 84. For the surplus stock on the higher shelves a longer common ladder of

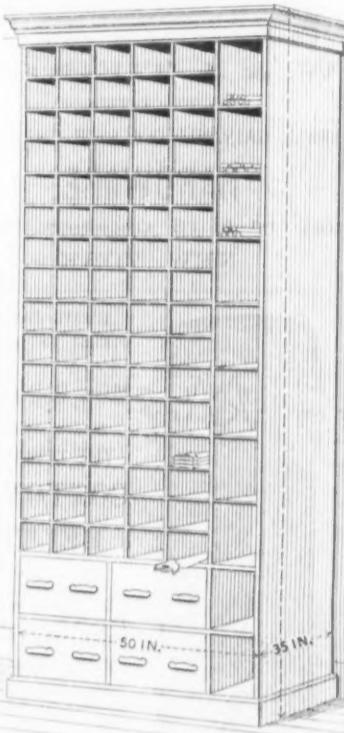


Fig. 88.—T. B. Rayl & Co.'s Hand Saw Rack.

rod is about 2 inches longer than the width of the box, thus permitting it to project 1 inch on each side into the notch in which it rests. The boxes have, as shown, a hinged flap about 7 inches wide, which is used in replenishing. A wooden button, $6 \times 1\frac{1}{2} \times 1$ inch, with upper corners beveled and fastened with a common tire bolt, is a good fastening for the flap. To prevent the Nail box from tipping too low a strip is nailed across the back side at the bottom, 13 inches long, which strikes the division posts 14

in an offset in the room. The counter used is only about 10 feet in length, and has about an 8-foot showcase in it. While I have very poorly described the store, yet here is the best displayed stock of goods in these lines I ever saw.

The Ironmonger of London, in a recent issue, calls attention to the matter of

RETAIL COMPETITION,

referring to the fact that for a long time past manufacturers and others who are engaged in what may be generalized as the wholesale trades have been complaining of the fierceness of competition, while the retailers, who have not had so much to say in public on the subject, have been suffering in a similar way. The competition has, it would appear, recently taken some new forms. The dealers have become familiar with the widespread operations of the London co-operative stores, and have been stimulated to adopt means whereby they are enabled to meet, and sometimes to beat, the stores on their own ground. Our contemporaries their remarks with reference to the more recent competition:

In all the large towns and cities his trade enemies are to be found among the "bonus tea-shops," "Little Dustpans," the oilmen, the general stores, "sixpenny shops," and the drapers. All these cut into his business and deal in goods which were formerly exclusively confined to ironmongers. The tea-shops give away all sorts of common rubbish in galvanized goods, Britannia metal, and domestic odds and ends. The "Little Dustpans" sell a variety of cheap articles, from Frypans and Mouse-traps upward, and the other minor competitors must do pretty much the same. The drapers, on the other hand, "go in" for better classes of goods, and in many cases push them so assiduously as to give the furnishing ironmongers of their respective localities a great deal of trouble. The drapers, as a rule, are very enterprising, and will stock anything for which they can make a sale. As yet they have not touched Tools, Black, Builders' or Coach Ironmongery, but in furnishing goods they are more at home, and by virtue of their proper business are often enabled to

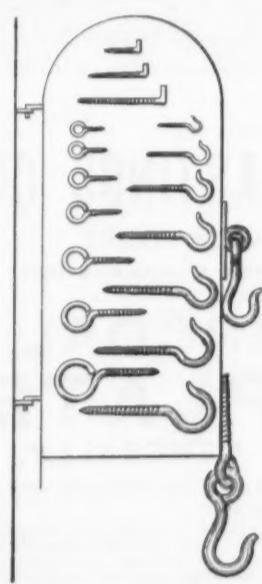


Fig. 85.—Swinging Sample Board.

shows the arrangement of the lower part of this shelving, the shelves being carried up nearly to the ceiling. The shelves above the ledge are $10\frac{1}{2}$ inches deep, 7 inches high and in sections 3 feet wide. The five upper shelves are used for surplus stock, and below these down to the ledge, a distance of 7 feet, the space is occupied by wooden boxes of

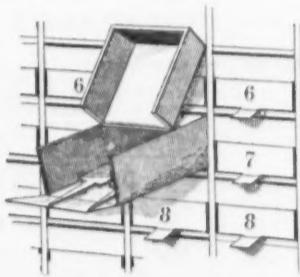


Fig. 87.—File Boxes.

light construction is used, but it is not often that a hasty demand is made upon these goods.

The method of managing Files is indicated in Figs. 86 and 87. All Hardware dealers are familiar with the difficulty, not to say danger, there is in handling this line of goods. Not infrequently serious injury is inflicted by the sharp tang of a File, which easily pierces the stoutest paper. The Files are displayed on sample boards, Fig. 86, on which the different sizes and styles are shown, and the Files for sale are kept in the File Rack represented in Fig. 87. This Rack consists of a sufficient number of pigeon holes to accommodate the various sizes and styles of Files, which are placed in strong paper boxes, lined with black canton flannel, the form of the box being indicated in Fig. 87, which shows one of these boxes drawn out. When the hinged cover which shuts over the front part of the box is raised, as in the cut, it permits the front of the box to fall open, so that the Files can be removed without pulling the box more than a few inches out of its pigeon hole.

We are indebted to T. B. Rayl & Co., Detroit, Mich., for the following description of a Saw Rack, which will doubtless commend itself to our readers as a convenient and very effective way of disposing of a complete line of Hand Saws in small space. It is described as follows:

The dimensions of our Rack for Hand Saws, Fig. 88, are as follows: It extends from the floor to the ceiling, 12 feet, and is 4 feet 2 inches wide, with a depth of 35 inches. The pigeon-holes are 9 inches wide and 6 inches high. The Rack is made of $\frac{3}{4}$ -inch stuff, and we have five pigeon-holes in width, and 16 in height, leaving room at the bottom for four drawers, Compass Saws, &c. The Saws are taken from the packages, and laid flat, handles to the front. The Saws meeting with readiest sale are put nearest the floor, and are put each point in a

force sales of Bedsteads, Coal-Vases, Fenders, Kitchen Utensils, Fireirons and the like.

The Ironmonger then refers to buying as giving the secret of successful business, and intimates that in that respect most of the drapers have the reputation of being adepts. Whether or not they really buy better than the Hardware men, it is said to be certain that in most instances they sell at lower prices, and the inference is drawn that they are content with smaller profits, relying on "turning over the money" more frequently, to make themselves good in the long run. They then refer in the following terms to the adoption of a similar policy on the part of the regular trade as the only way of meeting this competition, and urge upon the dealers they represent the importance of

uniform size, with the exception of the two lower shelves, on which the boxes are only of half height. To each box is attached a sample of its contents. This system, as has been said, extends the length of the room. Beneath the ledge, which is 12 feet wide, is a row of bins about 15 inches deep with sloping lids, as will be seen in the cut, Fig. 84. On these lids are fastened samples of the goods beneath. It has always been a difficult matter to properly display and

not understand that it is better to make 15 per cent, five or six times a year on a given sum than to get 50 per cent. once a year, or perhaps in two years; and they object, in general, to the work involved in doing a large turnover. To those of this effete way of thinking any advice of ours would necessarily be superfluous; but those who are mobile, and willing to move with the times, we would urge to pay court to King Cash, and to make "small profits and quick returns" their motto.

Electrolytic Copper Tubes.

Messrs. Elmore & Co., electrical engineers, of London, have made important improvements in depositing copper in various forms, and are making copper tubes by the depositing process. They take a hollow tube of type metal, coated on the parts where they want the deposit with bronze powder, and insulated on the others. They impart a slow rotary motion to the type-metal core while suspended in the bath, and so soon as the deposit begins to form a burnisher is applied by a light pressure to the side of the cylinder. This burnisher has a motion parallel with the axis of the cylinder, moving backward and forward, up and down the cylinder. The combination of the movement of the cylinder around its axis and of the burnisher parallel with it has this effect, that it disposes the crystalline deposit in a fibrous mass, with the fibers leading in a screw-like manner around the axis of the tube. It is asserted that the specific gravity of the copper is higher than that of any other form of copper, and they claim that the strength exceeds that of hard-drawn copper.

Experiments are being conducted at Philadelphia in telegraphing messages, which possess some interest. The apparatus consists of two neat-looking instruments resembling type-writers with telegraphic attachments placed beside each other. A wire leads from one to the city of Reading, 60 miles away, and, returning, ends at the other, a few feet off. A lad presses the lettered keys the same as in operating a typewriter; the electric current flashes instantaneously 120 miles and prints in plain, bold letters on a sheet of paper upon the adjoining machine a message. The same letters are recorded upon an endless roll in front of the sender as are printed upon the receiver, so that a mistake made can readily be corrected. The apparatus is the invention of Mr. J. H. Linville. Messages can be sent or received upon the same instrument by merely turning a switch. If the receiver happens to be absent when "called up," the message is not lost, but it automatically records itself, even though it should be 1000 words in length. It is impossible to read by sound.

Mexico last year greatly increased her export both of metals and general merchandise. In Mexican currency the value of the exports to the United States in 1885 was \$10,491,590, as compared with \$8,630,576 in 1884. The value of the metal exports to the United States for the same periods was, respectively, \$26,856,000 and \$17,308,000, an increase of \$3,548,000 for 1885. But the great reform which the constitution demands, as well as the exigencies of the growing export trade of the country, is yet to be accomplished. By executive proclamation the interior State taxes must cease on December 1 next, and the President has just called the attention of Congress to the matter as one demanding its urgent attention. Antonio Carvallo would make still more general the application of the law of January, 1885, which imposes a tax of $\frac{1}{2}$ per cent. on the value of all sales and purchases made at shops, warehouses, offices, manufactories, &c. And in order to make good the amount which will be lost to the several State revenues by the abolition of the interior duties, it is proposed to raise the merchandise tax from $\frac{1}{2}$ of 1 per cent to $1\frac{1}{2}$ per cent, or, possibly, $2\frac{1}{2}$ per cent. It is calculated that by raising the tax to an adequate amount within the limit proposed the entire State revenue now produced by the internal duties, some \$3,000,000, will be made good. Under the system proposed the Federal Government will collect the tax and divide the portion due the State among them.

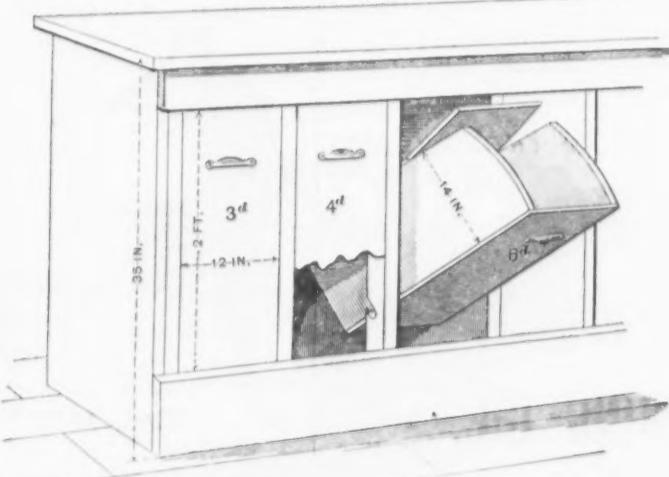
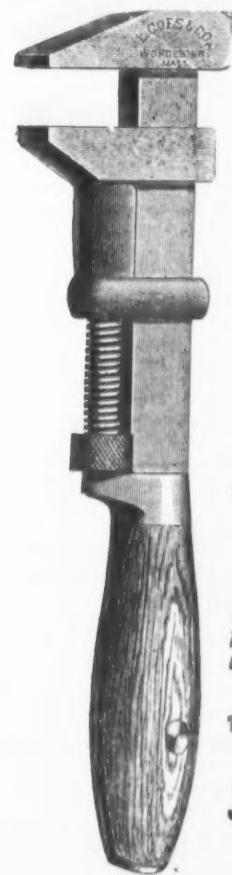


Fig. 89.—Nail Counter.



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GENUINE IMPROVED
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PATENT
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ESTABLISHED IN 1839.

Patented July 6, 1880.
Patented July 8, 1884.
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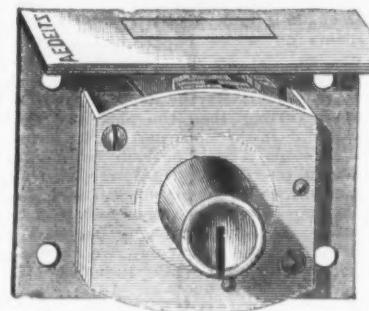
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Straight Bar, Extra LONG NUT
FOR SCREW IN JAW.

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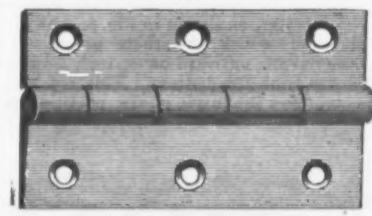
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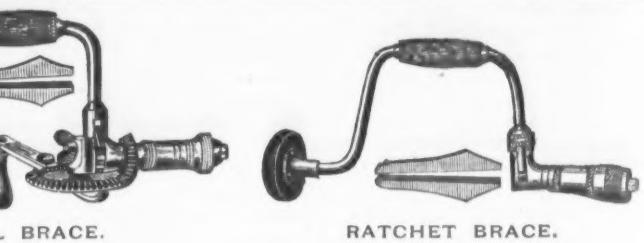
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We felt certain that good workmen would buy good tools, and that they would find them in some place. The result bore out our anticipations. Though business generally was not remarkably good, we found at the end of the year that our Brace sales had been larger than ever before.

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BOILER PLATES,
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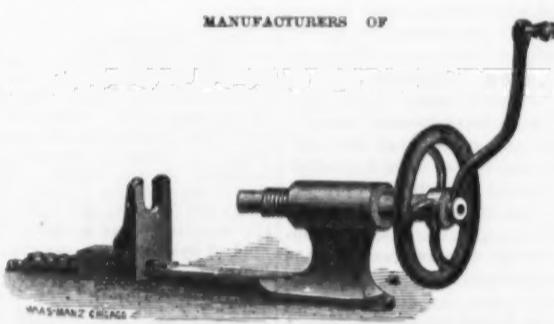
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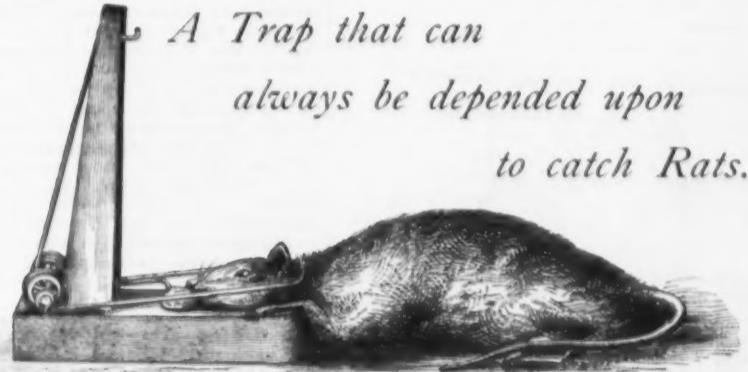
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May 13, 1886.

MECHANICAL.

The Hydraulic Ram.

Writing on the principle of the hydraulic ram applied to large machinery for raising or forcing water, compressing or exhausting air, or motive-power, Mr. H. D. Pearsall, in a recent issue of *Engineering*, says:

I recently had the following case to deal with. Required, a large supply of water in a mountainous country 300 feet above the level of the stream from which the supply was to be drawn. The usual method would have been to take a canal off from the river some miles up. In this case it would have been necessary to go 10 or 15 miles up the river to get the required level. But the discharge of the river being much greater than the supply required, it was a question whether it would not pay better to use this water-power to pump the supply required rather than make so long a canal to bring the supply by gravitation. If it was a question of pumping by turbines and force pumps, however, I found that the cost would equal that of the canal. It then appeared to me possible that the pumping might be done on the principle of the hydraulic ram at very much less cost. But on application to the principal makers of rams both in this country and in the United States they could not supply me with any such machinery on the scale required, and on consideration it was evident that all known forms of rams were quite unsuited to the work.

I therefore designed machinery similar to that I am about to describe (but larger than the machine here shown), and it will shortly be constructed at a very moderate cost. One machine has already been made and gave very satisfactory results. I find that the main features of the design are also applicable to a great variety of other circumstances, including air compression, raising sewage, &c., and accordingly the invention has been protected in all the principal countries. The essential principle of the hydraulic ram is this: A mass of water is

Sommeiller's, will, under the same circumstances, do as much as 10 of his machines did. This statement is startling but it will be clearly seen by the explanation below that this is the fact. The defects which were discovered in the practical working of his machines have also been efficiently provided against. One form of the machine is shown in Fig. 1. A somewhat simpler construction is possible for machines of this size and smaller, but I shall not refer to these further here, as I wish to describe only the application to large machinery. As regards rams of the ordinary size, say 4-inch and 6-inch pipes, I do not refer to them at all; the ordinary construction leaves nothing to be desired in simplicity and is good enough for such small machinery.

In Fig. 1 A is the flow-pipe conducting the water from the source to the tail-race B. C is the main valve, opening and closing communication with the tail-race. D D are delivery-valves opening into the air vessel

E of the great difference in size between one of these machines and one of Sommeiller's, for the same power, will therefore now be understood, as the mean velocity of the water in Sommeiller's machine was only one-twentieth of the maximum velocity, whereas in these machines it is half. A very considerable velocity, greatly exceeding that

ring O is separate from the valve, and is retained in the pipe. When the valve is moved up close to this ring, any pressure in the pipe forces the ring against the edge of the valve (and against the pipe), making the water tight joint; but in opening the valve the ring has not to be carried past the orifice, thus avoiding the wear of an ordinary piston-valve; and yet there is no bringing of the valve hard on to its seat, as in ordinary valves with fixed seatings.

I have also designed several other forms of the machine for the following cases: 1. Where it is desired to pump other water than the power water without mixing the two. 2. For exceptionally high or low falls. 3. For raising water by suction. 4. For exhausting air. 5. For discharging the "waste" water under pressure, as, for instance, using water from a main with a pressure of 100 feet, 20 feet of the pressure may be used in such a machine and the waste water still have a pressure of 80 feet.

The uses of such machines as this will be obvious from the above descriptions. They are available wherever any considerable water-power is to be utilized either for raising or forcing liquids, or for compressing or exhausting air. They also afford a good means of obtaining motive-power for any other purposes where the power is required at a distance from the source of power, the power being transmitted either by water under pressure or by compressed air. The arrangement also constitutes an inexpensive means of utilizing water-power which is not constant in its action, such as tidal-power. From the small cost of very large pumping machinery on this plan, a large quantity of tidal water may be passed through such a machine at extreme high and low tides, raising part of such water to a reservoir on any convenient elevation in the neighborhood, whence a constant water-power may be drawn. The most obvious advantage of machines on the principle of the hydraulic ram is that it is the only practical method of doing in one machine the work which otherwise requires a combination of turbines or water-wheels and pumps or air compressors, and of performing in one operation the work otherwise requiring a cycle of operations. The results of this simplification are a marked economy both in first cost and in working expenses and increased efficiency.

As regards the features of the actual design the following points may be noted: The motion of the water is not interfered with by any tortuous passages, and is subject to no reversal or regurgitation or impact against mass. The valve has no heavy mass falling on solid surfaces, but its motion is at moderate speed, and is one of gradual acceleration and retardation, and the construction is such as to permit of adequate strength when made of any size, however large. The water may be used at a considerable velocity, and the work done by a machine is therefore very great for its size. This will be seen by the example in Fig. 2. The construction is simple, and there is but little to keep in order. The form is such as to give the greatest strength with the minimum of material. A machine was constructed last year and experimented with in London, with the result of giving an efficiency of over 80 per cent. and proving that the action was smooth and free from violence, that a high velocity of water gave no difficulty, and that the action of the machine corresponded very exactly with what had been determined theoretically, and was under easy control.

The Triumph Band-Saw Sharpener.

There are various automatic machines on the market for the purpose of sharpening circular saws, but thus far there has been none which was adapted to doing the same work on small band saws. With the growth of the band saw in favor, so that every wood working establishment has one or more of them, the problem of rapidly and accurately sharpening them has become important. The engraving which we present of what is known as the Triumph Band-Saw Sharpener, made by Halladay, Litchfield & Co., of Chicago, Ill., will accordingly prove of interest.

The cut represents a No. 5 machine specially adapted for small band saws.

The saw is carried on two horizontal pul-

wheels which grind the face of a tooth. While the saw is being moved forward the emery-wheel slowly rises, grinding the back of the next tooth. The framework which carries the saw is adjustable to various widths of saws by means of the hand wheel and screw seen at the right front corner of the frame. The gearing of the machine is such that with the driving-shaft running at 1200 revolutions a minute the emery-wheel makes 3300 revolutions a minute, and feeds 100 teeth per minute, the average capacity of the machine. So steady is its motion that an emery-wheel only $\frac{1}{16}$ inch in thickness is used. The New York Supply Co., Limited, 50 and 52 John street, New York, are the agents.

Heating Feed-Water at Sea.

Speaking broadly, remarks the London *Engineer*, an economy of about 13 per cent. can be effected by raising the temperature of feed-water from 60° to 212° F. The calculation is very simple. Let the pressure be 120 pounds, and the temperature of the water 60° . Each pound of steam will contain 1160 units measured from 60° —that is to say, each pound of water pumped into the boiler at 60° will carry away with it, in the shape of steam, 1160° , which it must obtain from the furnace. If now, by means of heat otherwise wasted, we raise the temperature of the feed to 212° , then each pound of steam will still carry away 1160° , but of this, $212^{\circ} - 60^{\circ} = 152^{\circ}$ will have been obtained, not from the furnace direct, but from the waste heat, and the saving will be $\frac{1160}{152} = 7.63$ —that is to say, more than one-seventh of all the fuel burned, or nearly 13 per cent., will be saved. If the temperature of the water supply is lower or that of the feed-water higher, then the saving effected will be augmented. Now, about the maximum economy claimed for the triple-expansion as compared with the double-expansion system is 15 per cent. Hence it follows that if the temperature of the feed-water at sea were raised from 50° to 212° by waste heat, the double cylinder compound engine would be as economical as the triple-cylinder engine provided the latter worked with cold feed. This deduction does not apply, however, in practice, for the feed-water is usually delivered into a marine boiler at about 120° from the hot well; and our figures will stand thus: Taking the pressure at 120 pounds, as before, each pound of steam carries away—measuring this time from zero, which simplifies our figures and comes to the same thing in the end— 1220° , of which 120° are supplied by the feed-water and 1100° by the furnace. That is to say, $\frac{1220}{120} = 10$, or about one-tenth of the whole heat required comes in with the feed-water. If the temperature of this last had been that of the sea, or, say, 50° , then we should have $\frac{1220}{50} = 24$, or only $\frac{1}{4}$ part of all the heat required would be supplied with the feed-water. If the feed had been pumped in at 212° , then $\frac{1220}{212} = 5.75$. Under ordinary circumstances 10 per cent. of all the heat needed comes from the hot well. If the feed were raised to 212° , then about 17 per cent. of all the heat would come in with the feed, and the saving to be effected as compared with the ordinary method would be about 7 per cent., or, say, one-half that got by tripling expansion.

At a time when economy is so much studied at sea it seems at first sight strange that more attention than it has yet received has not been directed to the heating of feed-water. There are, however, many difficulties in the way, none of which seem, however, to be insurmountable. Two methods suggest themselves. The first is to pass the exhaust steam through a subsidiary condenser, so to speak—that is to say, a box containing a nest of tubes through which the feed-water pumped from the hot well shall be forced while on its way to the boiler. The idea involved is that the steam will be hotter in this box than it will be subsequently on the surface condenser. The fact is, however, that the temperature in the exhaust-pipe is very little, if at all, above that of the condenser; certainly not enough to make the adoption of the device we have just named worth having. Nor can it be otherwise. The temperature of steam in an exhaust-pipe or anywhere else cannot exceed that due to its pressure. To begin with, the steam in a compound engine has a terminal pressure far below that of the atmosphere, so that the jet could not possibly heat the feed-water to 212° , and in the second place, the pressure in the exhaust pipe

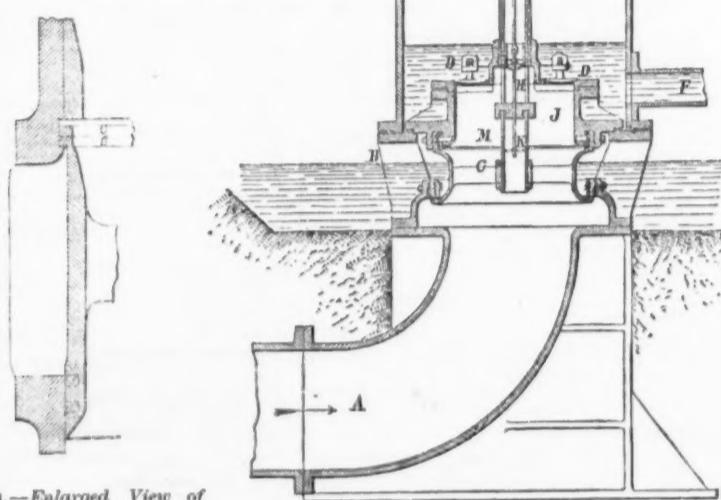
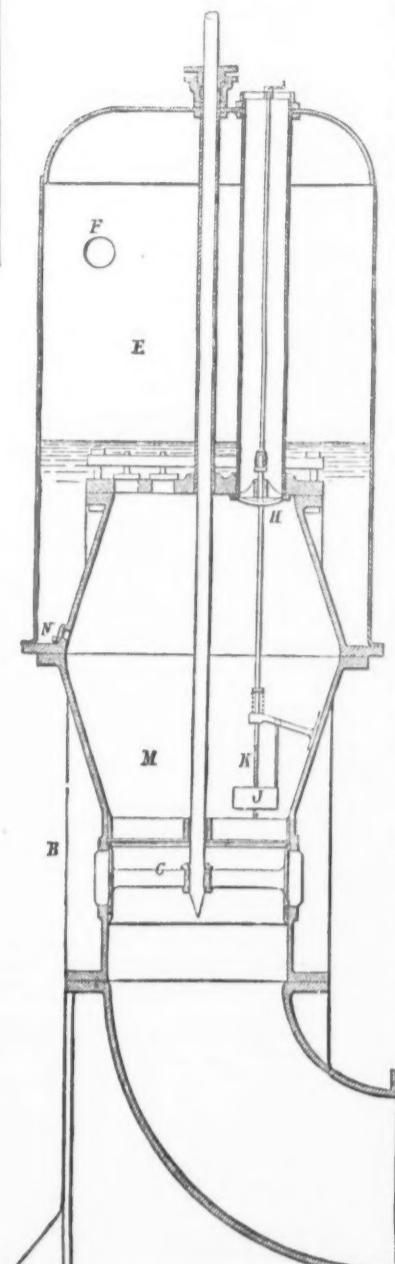


Fig. 3.—Enlarged View of Portion of Main Valve Shown in Fig. 2.



THE HYDRAULIC RAM.

allowed to flow freely by the influence of gravity for a short time and thus acquire a certain velocity, and therefore energy. Its free outlet is then closed and the construction of the machine must be such that the acquired energy is expended against the resistance of an air vessel. When it is required to utilize the power in forcing any kind of fluid, this principle obviously has advantages over any of the other three principles on which water-power engines are constructed, inasmuch as it may be made to accomplish the desired object at one operation and in one machine, instead of through a more or less complicated cycle of operations and machines. Even where it is required to use the power for other purposes, this principle still has advantages in some cases. Hitherto, however, the only application of the principle has been in the common ram invented by Montgolfier just a hundred years ago, and very little improved on since. Almost all the attempts at improvement have been only slight modifications, and have retained features which have unfitted these machines for use on any but a small scale, as more or less violent shocks are the inevitable accompaniments of their action. Indeed, this violent action has come to be regarded by many people as essential to the working of such machines, and it is commonly supposed that there must necessarily be something of the nature of a blow. Hence the name of "ram." Careful consideration, however, accompanied by experiments, demonstrates that this is an error. Violent shock is not essential to the action of machines on this principle, though it is an invariably accompaniment of all existing machines. But it can be avoided, and by its avoidance the efficiency is not only not impaired, but it is increased. The name of ram is therefore a misleading one. I may add that, even if rams of ordinary construction could be used on a large scale, they would not be economical, as the greatest velocity of water admissible is low, and therefore the number of such machines required would be large.

The greatest advance toward the true method of construction of such machines on a large scale was made by the celebrated engineer Sommeiller, in the machinery he made for the Mont Cenis Tunnel. His design was a great departure from all other types of rams and avoided their chief defects. It proved the possibility of using the principle on the largest scale, and his designs had sufficient success to cause the erection of 20 large machines, 10 of which were erected after the others had been in operation for more than a year. His design, however, was as expensive as a combination of turbines and pumps would have been, and it is therefore easily understood why the very fair success which he attained has not led to the general use of his machinery. By the method of construction I have devised one machine of the same size as one of

E. F is the delivery-pipe. The main valve is opened and shut by means of a small motor, G, which is worked by the compressed air in the air vessel. H is an air-valve carrying a float, J, the distance of which from H is adjustable by means of a screw, K, and wrench L. The action is as follows: The flow-pipe being full of water, the main valve is opened by the motor, and water flows into the tail-race, thus putting into motion all the water in the flow-pipe, the chamber M also emptying itself into the tail-race and being filled with air through the valve H. After the flow has continued for a certain time—say, for example, two seconds—the main valve is closed by the motor. During the closing of the valve the flow of the water is not checked, as it can rise without resistance in the chamber M, the air freely escaping by the valve H. The motion of the valve C need not therefore be rapid. When the main valve is closed and the water has reached a certain height in the chamber it raises the float J and closes the air-valve H. If the float be adjusted so as to close the air-valve while there is still some air in the chamber, this air is then compressed (by the energy of the column of water) till its pressure equals that in the air vessel, when it and some of the water is forced into the air vessel. Water thus continues to flow into the air vessel until the energy of the column of water in motion is exhausted by the resistance of the air vessel, when the column of water comes to rest and the delivery-valves gently close. The action of the motor is timid, so that after this has taken place the main valve is again opened and the cycle of operations is repeated. Of course water flows out of the air vessel continuously under pressure through the delivery-pipe F.

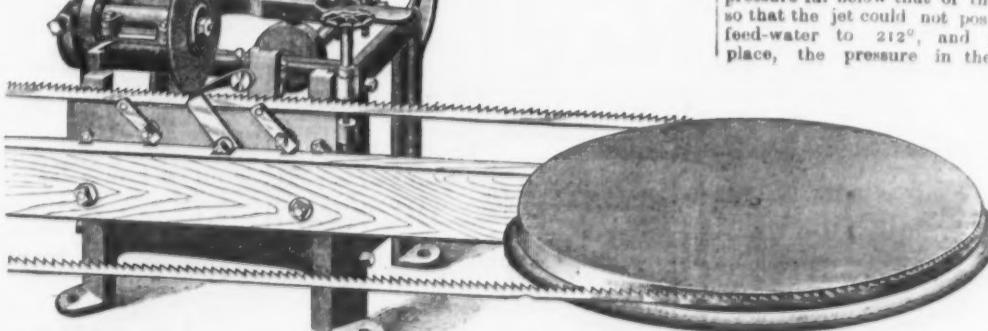
It is not necessary ordinarily to confine and compress more than a very small quantity of air in the chamber. If the small quantity to supply the motor be confined, it will also be ample to provide all the cushioning that is desirable. In starting the machine, however, it is an advantage to adjust the float so as to force in a considerable quantity of air, so as to fill the air vessel with compressed air and reduce the water level to a height of a few inches only above the valves, at which height it can easily be kept, thus avoiding any mass of water above the valves and utilizing the full capacity of the air vessel. In the method of working described above, the water in the flow-pipe is evidently always in motion in one direction (the state of rest being momentary), and its velocity varies periodically from zero to a certain predetermined maximum; the mean velocity is therefore half of the maximum velocity. It is evident that the size of a machine requisite for any given power is dependent on the mean velocity of flow which can be maintained, but it is the maximum velocity which is limited by considerations of friction, &c. The reason

used in common rams, is found to occasion no difficulty. I have also worked such a machine in a somewhat different way—opening the main valve before the column of water has come to rest, or when it has only been somewhat retarded—and I find the action sufficiently smooth when worked thus. This, of course, further reduces the size of the machine required for a given discharge of water, as it further increases the mean velocity in the flow-pipe with the same maximum velocity.

Fig. 2 is a machine on the same principle for compressing air. As the parts are similarly lettered and the action is identical, it will not be necessary to describe it in detail. The chief difference is in the size of the chamber M, and that, of course, the delivery-

valves which are adjustable to fit different lengths of saws. The driving-shaft is seen at the back of the machine. It connects by a belt with the shaft on which the emery-wheel is hung, and by means of a worm with the feed-shaft. The feed-shaft carries an eccentric upon which rests the lever by means of which the emery-wheel is raised and lowered as the teeth of the saw are moved into place. The feed-finger is attached to a perpendicular lever pivoted at the lower end, and which is moved by a crank at the end of the feed-shaft. The crank connects with the feed-lever by means of a block worked by the crank in a groove in the lever. The crank can be adjusted to or from the center of the feed-shaft, thus allowing for any distance between teeth. Any desired hook can be obtained. The saw is stationary during half the revolution of the feed-shaft, and during that time the

levers which are adjustable to fit different lengths of saws. The driving-shaft is seen at the back of the machine. It connects by a belt with the shaft on which the emery-wheel is hung, and by means of a worm with the feed-shaft. The feed-shaft carries an eccentric upon which rests the lever by means of which the emery-wheel is raised and lowered as the teeth of the saw are moved into place. The feed-finger is attached to a perpendicular lever pivoted at the lower end, and which is moved by a crank at the end of the feed-shaft. The crank connects with the feed-lever by means of a block worked by the crank in a groove in the lever. The crank can be adjusted to or from the center of the feed-shaft, thus allowing for any distance between teeth. Any desired hook can be obtained. The saw is stationary during half the revolution of the feed-shaft, and during that time the



SMALL BAND-SAW SHARPENER, MADE BY HALLADAY, LITCHFIELD & CO., CHICAGO, ILL.

assimilates itself to that in the condenser the moment after the slide-valve opens the port to the exhaust-pipe. Nothing whatever is to be had from waste steam. The second plan consists in pumping the feed-water through a set of pipes arranged in the smoke-box. There is always plenty of heat available here, but it is not easy to get in all the heating surface needed without interfering with the draft and with access to the tube ends. It does not appear, however, that there would be any insuperable obstacle in the way of mounting the feed heating tubes in a swing frame, which could be turned right out of the way just as the smoke-box doors are when necessary; indeed, the frames might be secured to the smoke-box doors. Of course cocks would be placed in the line of the hinges to cut off

(Concluded on page 31.)

Ladies.	
Melting, Sargent's.	dis 55 & 10 %
Melting, Bedding.	dis 35 & 10 %
Melting, Monroe's Patent.	dis 50, 40 & 5 %
Melting, P. S. & W.	dis 35 & 10 %
Melting, Warner's.	dis 30 & 5 %
Lanterns.	
Tubular, Standard No. 0, # doz.	\$6.75 @ \$7.00
Tubular, Standard No. 1, # doz.	8.25 @ \$8.25
Tubular, Lift Wire, No. 0, # doz.	8.50
Tubular, Lift Wire, No. 1, # doz.	10.00
Guards for Tubulars, add # doz.	1.25
Potice, Small, \$6.00 Medium, \$7.35 Large, \$8.75	dis 50 & 10 %
Porter's Tin R. R.	dis 10 & 12.50
Owl.	dis 20 & 25 %
Lawn Mowers.—Regular List.	dis 50 @ 50 & 5 %
Lemon Squeezers.	
Porcelain Lined, No. 1.	# doz. \$6.00 dis 55 & 20 %
Wood, Common.	dis 50 & 10 %
Dunlap's Improved.	# doz. \$3.75, \$4.25
Saint's, No. 1, \$5. 2, \$6. 12. 13. 18.	dis 25 & 20 %
Jennings' "Star".	# doz. \$2.50
The "Bom."	# doz. \$2.50
Sevan's.	dis 1, # doz. \$6.50, 2, \$6.50, 3, \$7.50
King.	dis 40 & 5 %
Lines.	
Cotton and Linen Fish, Draper's.	dis 50 %
Draper's Chalk.	dis 60 %
Draper's Mason's Linen, 84 ft., No. 1, \$1.25; No. 2,	\$1.75; No. 3, \$2.25; No. 4, \$2.75; No. 5, \$3.25, No. 6, \$3.75
Silver Lake, Braided, Nos. 20, 25, 30, No. 1, \$2.50; No. 2, \$3.00; No. 3, \$3.75; No. 4, \$4.50	dis 25 & 30 %
Masons' Linen, No. 3, \$1.50; No. 4, \$2; No. 4, \$2.	dis 40 & 5 %
Wool Clothes, No. 18, \$3.75; No. 19, \$3.85; No. 20, \$2.75.	dis 25 & 30 %
Ventilator Cord, Samson Braided, White or Dark Cotton.	dis 7.50
Locks, Padlocks, Cabinet Locks, &c.	
Door Locks, Latches, &c.	
List Dec. 18, 1885.	
Nimick & Brittan's Burglar Proof Locks.	dis 45 & 2 %
Rosenberg's Cabinet Co., list Feb. 2, 1885.	dis 40 & 5 %
Perkins' Burglar Proof.	dis 60 & 25 %
Plate.	dis 33 & 2 %
E. Many's "Extension Cylinder".	dis 10.50 @ \$12.50 net
Yale & Towne Mfg. Co.	dis 40 & 5 %
Dieitz Flat Key.	dis 30 %
L. & C. Kound Key Latches.	dis 40 & 10 %
L. & C. Flat K. V. Latches.	dis 20 %
Homedale Key Latches.	dis 20 %
Yale New List.	dis 40 %
"Shepardson" "U. S."	dis 30 %
"Feltor" or "Amer-can".	dis 40 & 10 %
Seed's N. Y. Hasp Lock.	dis 25 %
Padlocks.	
Changes made in last price of some numbers March 10, 1884, and Jan. 1, 1885.	dis 40 & 2 %
Corbin.	dis 40 & 5 %
Dieitz.	dis 40 & 10 %
Dieitz, Nos. 51 to 64.	dis 40 & 10 %
Dieitz, Nos. 86 to 90.	dis 30 %
Stoddard Lock Co.	dis 30 & 10 %
"Champion" Night Latches.	dis 40 & 5 %
Barnes Mfg. Co.	dis 40 & 5 %
gagle and Corbin Trunk.	dis 25 & 2 %
"Champion" Cabinet and Combination.	dis 33 & 4 %
Romer's.	dis 25 %
Padlocks.	
Hunt & Brown.	
Mallory, Wheeler & Co.	list Dec. 23, 1884. Dis 65 & 10 @ \$65 & 10 & 10 %
Nimick & Brittan Mfg. Co.	
Wm. Wilcox & Co.	
Norwich Lock Co.	
Yale Lock Mfg. Co.	dis 40 %
Safe.	
Eureka, Eagle Lock Co.	
Romer's, No. 0 to 91.	
Romer's, No. 200 to 500.	
A. Dietrich.	
"Champion" Padlocks.	dis 33 & 4 %
Hotchkiss.	
"Star".	
Yale.	
Shoe Shine, # doz. 40.	
Barnes Mfg. Co.	
Nox's.	
Brown's Patent.	
Scandinavian.	
Fraim's Pat. Scandinavian, new list 1885.	
Lumber Tools.	
Ring Peavers, Blue Line" Finish.	dis 50 @ \$20.00
Ring Peavers, Common Finish.	dis 50 @ \$18.00
Steel Socket Peavers.	dis 20 @ \$21.00
Mail. Iron Socket Peavers.	dis 19.00
Cant Hooks, "Blue Line" Finish.	dis 50 @ \$20.00
Cant Hooks, Common Finish.	dis 50 @ \$18.00
Can Hook, Mail. Socket Class, "Blue Line".	dis 10.00
Pinlays.	
Cant Hooks, Mail. Socket Class, Common.	dis 50 @ \$20.00
Mallory, Wheeler & Co.	list Dec. 23, 1884. Dis 65 & 10 @ \$65 & 10 & 10 %
Standard List.	dis 70 & 10 @ \$70 & 10 & 10 %
Diston's.	dis 45 & 10 %
Pocket Levels.	dis 70 & 10 @ \$70 & 10 & 10 %
Dieitz Inclinometers.	dis 10 & 20 %
Poppers, Cork.	
Round or Square, 1 qt.	per gro. \$4.50 @ \$15
Round or Square, 2 qt.	per gro. \$25 @ \$20
Post Holes and Tree Augers and Diggers.	
Post Hole Digger.	dis 300 @ \$30.00 dis 20 & 25 %
Boydton Post Hole Augers.	dis 300 @ \$30.00 dis 20 & 25 %
Eureka Diggers.	dis 300 @ \$16 @ \$17
Yale Post Hole Auger, per dozen.	dis 300 @ \$30.00 dis 20 & 25 %
Plumbers, Cutters.	
Plumbers, Cutters.	dis 30 & 10 %
Standard List.	dis 70 & 10 @ \$70 & 10 & 10 %
Leach's.	dis 45 & 10 %
Stoddard Lock Co.	dis 30 & 10 %
"Champion" Night Latches.	dis 40 & 5 %
Barnes Mfg. Co.	dis 40 & 5 %
gagle and Corbin Trunk.	dis 25 & 2 %
"Champion" Cabinet and Combination.	dis 33 & 4 %
Romer's.	dis 25 %
Padlocks.	
Hunt & Brown.	
Mallory, Wheeler & Co.	
Nimick & Brittan Mfg. Co.	
Wm. Wilcox & Co.	
Norwich Lock Co.	
Yale Lock Mfg. Co.	dis 40 %
Safe.	
Eureka, Eagle Lock Co.	
Romer's, No. 0 to 91.	
Romer's, No. 200 to 500.	
A. Dietrich.	
"Champion" Padlocks.	dis 33 & 4 %
Hotchkiss.	
"Star".	
Yale.	
Pruning Hooks and Shears.	
Diston's Combined Pruning Hook and Saw.	dis 50 @ \$15
Pruning Shears.	dis 50 @ \$15
Pruning Shears.	dis 50 @ \$15
Henry's Pruning Shears.	dis 50 @ \$15
Wm. Wilcox & Co. Common Combination.	dis 50 @ \$15
Dunlap's Saw and Chisel I. L.	dis 50 @ \$15
J. Mallinson & Co.	dis 50 @ \$25
Pruning Tools.	
Round or Square, 1 qt.	per gro. \$4.50 @ \$15
Round or Square, 2 qt.	per gro. \$25 @ \$20
Post Hole and Tree Augers and Diggers.	
Post Hole Digger.	dis 300 @ \$30.00 dis 20 & 25 %
Boydton Post Hole Augers.	dis 300 @ \$30.00 dis 20 & 25 %
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Mallory, Wheeler & Co.	
Nimick & Brittan Mfg. Co.	
Wm. Wilcox & Co.	
Norwich Lock Co.	
Yale Lock Mfg. Co.	dis 40 %
Safe.	
Eureka, Eagle Lock Co.	
Romer's, No. 0 to 91.	
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Pruning Shears.	dis 50 @ \$15
Henry's Pruning Shears.	dis 50 @ \$15
Wm. Wilcox & Co. Common Combination.	dis 50 @ \$15
Dunlap's Saw and Chisel I. L.	dis 50 @ \$15
J. Mallinson & Co.	dis 50 @ \$25
Pruning Tools.	
Round or Square, 1 qt.	per gro. \$4.50 @ \$15
Round or Square, 2 qt.	per gro. \$25 @ \$20
Post Hole and Tree Augers and Diggers.	
Post Hole Digger.	dis 300 @ \$30.00 dis 20 & 25 %
Boydton Post Hole Augers.	dis 300 @ \$30.00 dis 20 & 25 %
Eureka Diggers.	dis 300 @ \$16 @ \$17
Yale Post Hole Auger, per dozen.	dis 300 @ \$30.00 dis 20 & 25 %
Plumbers, Cutters.	
Plumbers, Cutters.	dis 30 & 10 %
Setting Tools.	dis 14.00 @ \$15.00
Worm Hooks.	dis 20 & 25 %
Landing Blocks.	dis 20 & 25 %
Skidding Tong.	dis 20 & 25 %
Log Binders.	dis 20 & 25 %
Hoist Block, 1/2 in. to 5 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 10 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 20 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 30 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 40 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 50 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 60 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 70 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 80 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 90 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 100 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 120 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 140 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 160 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 180 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 200 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 220 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 240 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 260 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 280 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 300 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 320 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 340 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 360 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 380 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 400 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 420 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 440 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 460 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 480 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 500 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 520 M. dis 20 & 25 %	dis 10 & 15 %
Hoist Block, 1/2 in. to 540 M. dis 20 & 25 %	dis 10 & 1

WHOLESALE METAL PRICES, May 12, 1886.

METALS.

IRON.—DUTY: Bars, 8-10¢ to 11-12¢ per lb.; provided that no Bar Iron shall pay a less rate of duty than 25¢. Sheet, 11-12¢ per lb.; Band, Hoop and Scroll, 1¢ to 1-10¢ per lb.; Railroad Bars weighing more than 25 lb. per yard, 7-10¢ per lb.

Standard American Pig Iron.

Foundry No. 1 X..... \$ per ton \$18.00 @ 18.50
Foundry No. 2 X..... \$ per ton 17.00 @ 17.50
Gray Forge..... \$ per ton 16.00 @ 16.50

No. 1 Scotch Pig Iron.

Carnbroe..... \$ per ton
Coltness..... \$ per ton \$18.00 @ 18.50
Shotts..... \$ per ton 16.00 @ 16.50
Glengarnock..... \$ per ton 15.50 @ 15.50
Gartsherrie..... \$ per ton 15.50 @ 15.50
Langholm..... \$ per ton 15.50 @ 15.50
Sunderlee..... \$ per ton 15.50 @ 15.50
Dumfriesshire..... \$ per ton 15.50 @ 15.50
Eghamton..... \$ per ton 18.00 @ 18.50
Clyde..... \$ per ton 18.50 @ 19.00

Rails.

Steel, at Eastern mills..... \$ per ton \$34.50 @ 35.00
Old Rails, T.S. \$ per ton \$19.50 @ 20.00

Scrap.

Wrought, \$ per ton, from yard..... \$19.50 @ 20.00

Bar Iron from Store.

Common Iron..... \$ per ton \$1.75 @ 1.80
2¢ to 1 in. round and square..... \$ per ton 1.75 @ 1.80
1 to 6 in. x 3¢ to 1 in..... \$ per ton 1.75 @ 1.80

Refined Iron: 2¢ to 1 in. round and square..... \$ per ton 1.75 @ 1.80
1 to 6 in. x 3¢ to 1 in..... \$ per ton 1.75 @ 1.80
1 to 6 in. x 3¢ and 5-16..... \$ per ton 1.75 @ 1.80

Rods—9¢ and 25¢
and 1-15 rods and staves..... \$ per ton 1.75 @ 1.80

Burden's "Iron, base price..... \$ per ton 1.75 @ 1.80

Urdens' "H. B. & S." iron, base price..... \$ per ton 1.75 @ 1.80

Norway Nail Rods..... \$ per ton 1.75 @ 1.80

Sheet Iron from Store.

Common Iron..... \$ per ton \$1.75 @ 1.80
American..... Cleanned

Nos. 10 to 16..... \$ per ton 2.70 @ 3¢
17 to 20..... \$ per ton 3.00 @ 3¢
21 to 24..... \$ per ton 3.25 @ 3¢
25 and 26..... \$ per ton 3.50 @ 3¢
27..... \$ per ton 3.75 @ 3¢
28..... \$ per ton 3.75 @ 3¢
Galvanized Stone Wire..... \$ per ton 3.75 @ 3¢

Galvanized to 20..... \$ per ton 5 @ 5¢
Galvanized 1 to 24..... \$ per ton 5 @ 5¢
Galvanized 25 to 26..... \$ per ton 5 @ 5¢
Galvanized 27..... \$ per ton 5 @ 5¢
Galvanized 28..... \$ per ton 5 @ 5¢
American Russia..... \$ per ton 10 @ 10¢
Russia..... \$ per ton 10 @ 10¢
American Cold Rolled B. B. \$ per ton 5 @ 5¢

Iron Wire. (See Wire.)

STEEL.—Duty: Ingots, Bars, Sheets, &c., valued at 4¢ per lb. or less, 45¢ ad val. ; valued above 4¢ and not above 7¢ per lb., 2¢ per lb.; valued above 7¢ and not above 10¢ per lb., 34¢ per lb.; valued above 10¢ per lb., 34¢ per lb. Extra—Steel Bars, &c., cold hammered or polished in any way in addition to ordinary hot rolling, 1¢ per lb. in addition to above; Steel Circular Saw Plates, 1¢ per lb. in addition to the above.

American Cast Steel.
For American steel, see Pittsburgh quotations.

Chrome Steel.

Tool Steel, ordinary sizes, 7¢ to 8 inches, net..... \$ per ton 10 @ 14¢

Admirantone Shoes and Dies..... \$ per ton 14 @ 16¢

Magnet Steel..... \$ per ton 14 @ 16¢

English Steel.

Best Cast..... \$ per ton 15 @ 16¢

Extra Cast..... \$ per ton 16 @ 17¢

Circular Saw Plates..... \$ per ton 14 @ 15¢

Round Saw, Cut..... \$ per ton 10 @ 12¢

Best Double Shear..... \$ per ton 15 @ 16¢

Bilster, 1st quality..... \$ per ton 10 @ 12¢

German Steel, Best..... \$ per ton 10 @ 12¢

2d quality..... \$ per ton 8 @ 9¢

3d quality..... \$ per ton 7 @ 8¢

Sheet Cast Steel, 1st quality..... \$ per ton 14 @ 15¢

2d quality..... \$ per ton 12 @ 13¢

3d quality..... \$ per ton 10 @ 11¢

TIN.—Duty: Plates, Sheets, Tagger and Terne, 1¢ per lb.; Bars, Block and Pigs free.

Banca..... \$ per ton 22 @ 22¢

Straits..... \$ per ton 21 @ 21¢

English..... \$ per ton 21 @ 21¢

Bar..... \$ per ton 22 @ 22¢

Charcoal Tin Plates.

1 C 10x14 22¢ sheets..... \$ per box \$1.00 @ 7.50

1 C 12x12 22¢ sheets..... \$ per box 1.25 @ 7.50

1 C 20x25 11¢ sheets..... \$ per box 0.95 @ 6.75

2 C 10x12 22¢ sheets..... \$ per box 0.95 @ 6.75

1 C 14x20 11¢..... \$ per box 0.95 @ 6.75

1 C 12x17 100..... \$ per box 5.00 @ 5.50

D C 12x16x17 100..... \$ per box 6.25 @ 7.00

D A 12x16x17 100..... \$ per box 6.25 @ 7.00

For each additional X add..... \$ per box 1.25 @ 2.00

Coke Tin Plates.

Best..... Ordinary.

C 10x14..... \$4.75 @ 4.60

C 14x16..... \$4.75 @ 4.60

C 12x12..... \$4.75 @ 4.60

C 10x10..... \$4.75 @ 4.60

C 20x25 112 sheets..... \$ per box 10.25

Terne Plates.

Prime Char. 2d. quality Coke.

C 14x20 M. F. \$6.87 1/2.

C 14x20 Old Process..... \$6.75

C 12x12..... \$4.00

C 14x20..... \$4.02 1/2 @ 4.87 1/2

X 14x20..... 6.25 @ 6.75

C 10x12..... 6.25 @ 6.75

C 12x12..... 12.75 @ 14.50

C 20x30..... 13.50 @ 15.00

Tin Boiler Plates.

XXX 14x26, 2 sheets for No. 7, 112 sheets..... \$ per box \$12.00

XXX 14x26, 2 " No. 8, " " 13.00

XXX 14x31, 2 " No. 9, " " 15.00

COPPER.—Duty: Pig, Bar and Ingots, 4¢; Old Copper, 8¢ per lb.; Manufactured (including all articles of which Copper is a component) of chief value added, 10¢ per lb.

Ingots, Lake..... \$ per ton 11¢ @ 12¢

Ingots, Baltimore..... \$ per ton 11¢ @ 11¢

Ingots Anchors..... \$ per ton 11¢ @ 11¢

Braziers' Copper and Sheathing, ordinary sizes, 16 oz. to sq. ft. and over..... \$ per lb.

Braziers' Copper and Sheathing, ordinary sizes, under 16 oz. and over 12 oz. to sq. ft. and over..... \$ per lb.

Lighter than 10 oz. \$ per sq. ft.

Circles less than 84 in. in diam. " 84 in. diam. and over..... \$ per sq. ft.

Segment and Pattern Sheets, Locomotive Fire-Box Sheets, Locomotive Fire-Box Sheets, Bolt Copper, Copper Bottoms, 14 oz. to sq. ft. and heavier..... \$ per lb.

Lighter than 14 oz. \$ per lb.

Flausing.

14x18, each..... \$ per sheet, 6¢

Boiler sizes, 7 in. by 10 in. each..... \$ per sheet, 12¢

Boiler sizes, 9 in. by 12 in. each..... \$ per sheet, 12¢

Other sizes not larger than 30x60..... \$ per sq. ft. 2¢

Larger than 30x60..... \$ per sq. ft. 5¢

Silver-Plated Sheet Copper for Amalgamating, prices furnished upon application.

For tinning both sides, double the above amount.

O'Neill's Patent Planchised Copper, Not.

14x18..... \$ per box 26¢

14 and 16 oz. and heavier, 27¢ By the case, \$ per box 26¢

12 oz. and lighter..... \$ per box 24¢

Boiler Sizes, 7 in. by 10 in. 14x60..... \$ per box 28¢

14 and 16 oz. and heavier, 29¢ By the case, \$ per box 28¢ (And all sizes not over 20 in. wide.) \$ per box 24¢

4 and 16 oz. and heavier..... \$ per box 31¢

2 oz. \$ per box 28¢

Planchised Brass same price as Planchised Copper

Copper Wire. (See Wire.)

Sheathing Metal, \$ per box 15¢ @ 15¢

BRASS AND GERMAN SILVER.

Brown & Sharpe's Gauge the Standard for Metal; Old English Gauge the Standard for Wire.

Brass Manufacturers' Price List, January 17, 1886.

Brass, Manufacturers' Price List, January 17, 1886.

LEAD. —DUTY: Pig, \$2 per 100 lb.; Old Lead, 2¢ per lb.; Pipe and Sheet, 3¢ per lb.	
Pig.....	5 @ 5¢
Bar.....	5¢ @ 5¢
Block Tin Pipe.....	10¢ per 20 lb.
Sheet.....	73¢ per 20 lb.
Black Pig bag, 25 lb. Drop, \$1.40; Buck, \$1.70	10¢ per 20 lb.
Black Pig bag, 25 lb. Drop, \$1.40; Buck, \$1.70	10¢ per 20 lb.
Hall's.....	9¢ per 10 lbs.
American, cash.....	4¢ per 10 lbs.
Cookson.....	9¢ per 10 lbs.
Bergenport.....	9¢ per 10 lbs.
ZINC.—Duty: Pig or Block, \$1.50 per 100 lb.	10¢ per 20 lb.
Sheet, 2¢ per lb.	10¢ per 20 lb.
Block.....	5.50 @ 5.70¢
Zinc.—Open.....	6¢ per 100 lb.
Zinc Tubing, Dia. 25 in.	10¢ per 20 lb.
Hall's.....	9¢ per 10 lbs.
Scotch and Extra Patterns.....	9¢ per 10 lbs.
BABBITT METAL.	\$ per lb.
N. P. U.	\$ per lb.
W. H. & S.	\$ per lb.
J. B. & S.	\$ per lb.
W. H. & S.	\$ per lb.</td

(Concluded from page 27.)

the feed when the doors were opened. A clever draftsman would have little difficulty in working this suggestion into a practical shape. There would remain, however, the objection that the tubes would soon become coated with soot, and would lose efficiency. The only way out of this would be in the use of moving scrapers, such as those employed on shore under somewhat similar conditions; but scrapers would no doubt be intolerable nuisances at sea. A very feasible arrangement was, however, suggested by Mr. Foley at a recent meeting of the North-East Coast Institution of Engineers, in the discussion on a paper on "Forced Draft," he proposes to do away with the back uptake, in the ordinary sense, placing it, so to speak, outside of the boiler instead of inside, and pumping the feed-water into a casing surrounding it. No doubt this would effectually raise the temperature of the feed-water, but it would do this not with waste heat, in the ordinary sense of the word; and the efficiency of the tube surface would no doubt be somewhat reduced. Heaters round funnels and in the funnel casing have been found very efficient. They have, however, an evil reputation as sources of danger, and consequently may be put out of consideration.

There is a system of heating feed-water at sea about which we have heretofore said nothing, because the results obtained are so flatly opposed to what would have been anticipated that we held our piece about them until we could satisfy ourselves that the statements made concerning these results are true. In the steamers of the Peninsular and Oriental Co. Weir's system has been in use some years and given great satisfaction. Steam is drawn from the intermediate receiver and blown into the feed-water, the temperature of which is raised very nearly to that of the steam in the receiver, or, say, to about 250°. The practical result at sea is a saving of 8 per cent. effected by raising the temperature of the feed, and calculation shows that about 4 per cent. is lost by the withdrawal of steam which would otherwise have gone to augment the work done in the low-pressure cylinder, thus leaving a net saving of 4 per cent. There appears to be no doubt whatever that this astonishing result is obtained. But more startling results have been obtained by Mr. Kirkaldy. He takes steam direct from the boiler, employs it to heat the feed-water, and secures an economy of over 7 per cent. At first this statement seems to be incredible. We find, however, a concensus of opinion among engineers and shipowners who have tried it. The result obtained was not anticipated. Mr. Kirkaldy held that it would be a good thing in the case of cargo-boats, usually pressed for time, if their boilers, after being emptied in port, were filled up with hot water instead of cold. To this end he arranged apparatus by which the donkey or steam-winch boiler could supply steam to heat the cold feed before it was pumped into the boiler. This worked very well, and he extended his operations so that the feed might always go in hot, not to save fuel, but to prevent the injurious strains which cold feed-water is likely to set up in a boiler. He argued, of course, that the steam can give up no more heat to the feed-water than it withdraws from the boiler, and that, as a matter of course, there could be no economy. It turned out, however, that the boilers to which the arrangement was fitted steamed better and held their pressure more steadily than before; and the result of careful trials leaves no doubt in our mind that the Kirkaldy heater does effect a very considerable saving in fuel. The result seems to be due in some yet-to-be-explained way to an augmentation in the efficiency of the heating surface of the boiler, probably due to better circulation. Of course, as we have said, as nothing can be taken out of the boiler that has not been first put into it, no direct economy can result from the use of steam drawn from the boiler to heat feed-water. Secondary influences are at work, and to these the economy effected is no doubt due. Mr. Kirkaldy's experience thus bears out Mr. Weir's. The whole subject is very curious and interesting, and deserves further consideration and investigation.

The Crosshead.

In a recent issue of the *American Engineer* we find the following relative to calculating the bearing area of crosshead slides:

The thrust of the connecting-rod as felt upon the slides of the crosshead varies between zero at the passing of the centers and the maximum effect when the center lines of crank and connecting-rod are at about right angles to each other, the specific angle depending upon the cut-off of the steam from the cylinder. If, now, P represents the total pressure upon the piston, S the stroke of piston and L the length of the connecting-rod, and if we represent the two component forces by P as for the piston pressure and Q the reacting pressure arising from the back thrust through the connecting-rod, we have from triangulation, Q equals the load or pressure upon the piston multiplied by S , the stroke, divided by the square root of four times the length of connecting-rod squared, less the square of the stroke, or

$$Q = P \frac{S}{\sqrt{4L^2 - S^2}}$$

If we desire to ascertain the thrust coming upon a crosshead slide, the load upon the piston being 150,000 pounds, the stroke of piston being 40 inches and the connecting-rod 100 inches long, we have by substituting in the above formula

$$Q \text{ or thrust} = 150,000 \times \frac{40}{\sqrt{4 \times 100^2 - 40^2}} = 30,600 \text{ pounds.}$$

When possible the crosshead should be of such area of rubbing surface of slides in regard to steam consumption, as the valve changes its position as soon as the condensation commences in the lower part of the chamber, while the usual tongue or ball arrangement will only act when the condensation has already extended to the top of the chamber, or be later. The piston-valve should therefore reduce steam consumption to a certain extent, and lift a greater quan-

Pulsometer with Piston-Valve.

Although the pulsometer is inferior to piston or plunger steam pumps in regard to consumption of steam, it compares less unfavorably with centrifugal pumps, and the absence of working parts except the valves makes it especially suitable for pumping dirty water in excavations or pit sinking. At all events there seem to be many occasions where the advantage of simplicity and absence of all external working parts outweigh the disadvantage of increased steam consumption, as the increasing number of pulsometers in use and of makers of this pump testifies. Mr. Hall's original pulsometer was made with ball-valves, which, however, have been abandoned by nearly all makers, disk or india-rubber valves being generally used for the suction and delivery valves, as in other pumps, and a flat tongue for the steam-valve. The pulsometer represented by the illustration, taken from *Le Constructeur*, was exhibited by Messrs. Georges et Cie. at the late agricultural show at Paris. It has a piston-valve in place of this tongue, which is moved by the combined action of the vacuum resulting from the condensation and steam pressure on the valve, and will act, as we are inclined to think, with greater certainty than the tongues, which occasionally are thrown back instead of falling over.

As the illustration shows, the valve consists of two pistons, K K, at the ends, and an intermediate piston, all being of the same diameter and made in one piece. The valve moves in a cylinder of bronze, with several ports corresponding with the ports of the

valve.

Mr. Swindell & Bros., Pittsburgh, build-

ers of regenerative gas furnaces, are chang-

ing all the furnaces of the Liggett Spring

and Axle Co., adapting them for the use of

natural gas, and have closed a contract with

the employees at Wm. McIlvain & Son's

boiler-plate mill, Reading, Pa., have been

granted an increase of 10 per cent. in wages.

The mill employs about 130 hands.

Topton Furnace (anthracite) in the Schuykill Valley, owned and operated by William M. Kaufman & Co., and which has been

making a successful run of several years,

will shortly be blown out for relining the

stack and also for heightening it to the

extent of about 15 feet. The furnace now

makes from 40 to 45 tons of iron per day,

and it is expected that the proposed ad-

dition to the stack will increase its produc-

tion about one-third, making a total produc-

tion of about 55 tons per day.

Messrs. Powell & Ulrich have established

the Novelty Iron Foundry at the shops re-

cently vacated by the Peerless Mfg. Co., on

Ninth street, near Main street, Louisville, Ky.

They will do a general jobbing busi-

ness, giving special attention to fine ma-

chinery and soft castings.

A company have been formed to utilize

the "Mits" method of casting wrought

iron. The syndicate that has been formed in

this country includes such names as John

Fritz, of the Bethlehem Iron Works; John T.

Morris, of Philadelphia; Frederick A.

Potts, of New York; R. H. Sayre, of the

Lehigh Valley Railroad; E. P. Wilbur, of

Bethlehem; R. C. Schenck, Jr., of Ohio;

R. G. Salmon, of Philadelphia; ex-Senator

T. C. Platt, of New York; and ex-Governor

Howard, of Rhode Island. The company

were organized under the laws of New

Jersey, and will confine themselves to the

granting of licenses for the use of the pro-

cess.

The directors are Charles Meyran, John Ewing, William A. Scott, H. S. Duncan and William A. Scott, Jr., of Pittsburgh, and Samuel Munnel and John F. Burke, of Canonsburg.

The Belleville Nail Works, at Belleville, Ill., will erect a large Bessemer plant this summer. The Belleville nail mill is one of the largest west of the Ohio River, and has been running nearly all the time that the others in the Western Nail Association have been idle.

The employees at the steel works of Carnegie, Phipps & Co., at Homestead, Pa., have organized a benevolent society. The dues are to be 50 cents per month. In case of sickness \$5 a week will be given, \$100 for natural death, \$50 for the loss of a hand, and \$500 in case of accidental death.

The nail factory of the E. & G. Brooke Iron Co., at Birdsboro, Pa., which suspended work during the past week, has resumed operations. Despite lost time the factory manufactured for April 20,000 kegs of nails. The work of erecting the additional house for the storage of nails is progressing rapidly. The building is 62 x 38 feet.

A new furnace was started at the National Tube Works, McKeesport, Pa., last week. A new butt-weld mill 400 feet in length is in course of erection.

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Jersey, and will confine themselves to the

granting of licenses for the use of the pro-

cess.

The Wainwright Mfg. Co., 65 and 67 Oliver street, Boston, have sold their feed-

water heaters to the following firms during

the past month: Flather & Co., Nashua,

N. H., 30 horse-power; Somersworth Ma-

chine Co., Salmon Falls, N. H., 100 horse-

power; C. W. Lyman, Somerville, Mass., 80

horse-power; Hoosick Falls Water Works,

Hoosick Falls, N. Y., 40 horse-power; three

heaters to the Cumberland and Presump-

scoot Mills, Cumberland Mills, Me., aggregat-

ing 115 horse-power; the Farrar Tack Co.,

40 horse-power; Emery & Holmes, Saco,

Me., 15 horse-power; Matthews Bros., Bel-

fast, Me., 100 horse-power, and to the fol-

lowing parties in Boston: William S. Butler

& Co., 100 horse-power; White, Payson &

Co., 50 horse-power; John R. Alley, 100

horse-power; Suffolk Mfg. Co., 75 horse-

power; A. L. Haskell & Co., 15 horse-

power; T. D. Cook, 25 horse-power; Fielder,

Moulder & Co., 25 horse-power. They have

made sales of their expansion joints to the

Buffalo Electric Light Co., Buffalo, N. Y.;

the United States Torpedo Station, New-

port, R. I.; the Lawrence Mfg. Co., Lowell,

Mass.; the New York Steam Heating Co.,

New York; the Boston Post Office and A. A.

Sanborn, Boston. Their filters have been

purchased by Doliber, Goodale & Co. (Melin's food), and the Agawam Mfg., Springfield, Mass., and one has been put in the

private residence of George O. Sears, Bos-

ton, and of C. U. Cutting, Boston. They have

recently closed a contract to furnish an

entire purifying plant for S. N. Brown

Imports.

The following were the Imports of Hardware, Iron, Steel and Metals into the Port of New York for the week ending May 12, 1886:

Baldwin Bros. & Co..	Mason John W. & Co.
Bethel Bros., 2	Wire rope, coils, 3
Boker Herman & Co.	Naylor & Co.
Hardware, cutlery and guns, pkgs., 20	Pig, tons, 165
Chains, cks., 25	Pim, Forwood & Co.
Anvils, pkgs., 149	Galv. iron, cs., 8
Brokers, J. J.	Seligman, J. & W. & Co.
Mach'y, pkgs., 19	Heavy scrap, tons, 304
Cutlery, cks., 3	Heavy scrap, lot, 1
Dodge Alfred.	Stetson Geo. W. & Co.
Mds., cs., 3	Pig, tons, 500
Downing, R. F. & Co.	Order,
Case, 1	Wire rods, coils, 19-
Field Alfred & Co.	Hoops, bds., 270
Anvils, 26	Rods, round pipes, 30
Mds., pkgs., 13	Oven, tons, 750
Fisher, J. L.	Old rails, 4928
Cutlery, case, 1	Rods, coils, 37,596
Folsom H. E.	Spiegel, tons, 693
Arms, cs., 5	Pig, tons, 280
Frasse, P. A. & Co.	Bars, 82
Pkgs., 10	Tee iron, bars, 1657
Hannell & Co.	Iron, tons, 70
Case, 1	Rails, 2135
Hartley & Graham,	Spiegel, kilos., 340,-
Cases, 4	000
Howland & Aspinwall,	Steel.
Mach'y, box, 1	Baring Bros. & Co.
Kasco, 2	Wire rods, coils, 1,
Mds., cs., 2	6452
Merch. Desp. Co.	Cary & Moen,
Spades, bds., 5	Casks, 21
Newton & Simpson,	Downing, R. F. & Co.
Files, cks., 2	Rods, 26
Nash, David	Newton & Shipman,
Mach'y, box, 1	Bundles, 25
Iron retorts, 3	Pilgrim Bros. & Co.
Oastler, W. C.	Cases, 2
Sweeping machines,	Bundles, 175
pkgs., 3	Bars, 2
Pim, Forwood & Co.	Rawlins, G. E.
Nails, kegs, 50	Cases, 11
Sellers, W. B.	Wagner W. F.
Mds., case, 1	Bds., 90
Stedberg, G. & Co.	Bars, 39
Mach'y, cs., 7	Cases, 4
Seeley & Howell,	Order,
Mach'y, pkgs., 3	Flange rails, 164
Wielbush, H. G.	Blooms, 259
Hardware and cutlery, pkgs., 16	Bars, 40
Witte John G. Bro.	Forgings, 10
Needles, cs., 3	Leaf spring, lot 1
Order,	Bundles, 165
Mach'y, case, 1	Casks, 2
Cases, 3	Cases, 11
Rivets, cs., 3	Scraps, cks., 4
Pkgs., 10	Metals.
IRON.	Bruce & Cook.
Brockner & Evans,	Tin plates, bxs., 250
Wire net'g, rolls, 30	Dickerson, Van Dusen
Baring Bros. & Co.	& Co.
Billetts, 346	Tin plates, bxs., 396
Bars, 7,261	Forwood, H. S.
Wire rods, coils, 608	Old brass, bds., 3
Brown Bros. & Co.	Montell, F. T. & Son,
Car-wheels, 45	Old metal, bds., 4
Crocker Bros.	Old brass, bds., 15
Pig, tons, 100	Phelps, Dodge & Co.
Spiegel, tons, 115	Tin plates, bxs., 802
Ferro, iron, cks., 50	Rosenstein Bros.
Cary & Moen,	Tin plates, bxs., 997
Colled rods, bds., 214	Central Stamping
Coddington T. B. & Co.	Co.
Sheets, bds., 288	Tin plates, bxs., 776
Foley, Edw.	Willett & Hamlin,
Mach'y, pkgs., 3	Yellow metal, cs., 100
Lazarus Freres,	Order,
Rods, coils, 7,832	Tin plates, bxs., 145
Lundberg Gust.	Tin and black plates,
bds., 721	bxs., 2155
River rods, coils, 221	Rain-water-pipes, 17

The importations of Cutlery, Hardware and Metals at this port during the week ending May 7 were as follows:

Quantity.	Value.
223	\$1,984
38	1,740
27	1,792
50	1,336
36	3,403
5	52
59	22,993
15	8,144
73	10,606
7	662
2,441	31,996
26	1,808
3,183	63,781
968	2,592
1,491	51,357
1,619	6,302
153	9,211
347	23,140
20	4,997
Old metal	188
Pumbago	330
Platinia	4
Pins	16
Quicksilver	152
Regulus antimony	100
Saddlery	18
Steel	141,883
Specks	112,000
Tin, per metal	3,287
Tin, lbs.	90,070
Tin, 16,186 slabs; 1,692,171 lbs.	367,225
Wire	17
Zinc oxide	190
	1,570

Coal Market.

The Coal market is steady at circular prices, which the trade profess to regard with fidelity. Pea is firmer, on account of short supplies. Nothing is said about prices for June. It is expected that the May allotment of 2,000,000 tons will be filled by the several companies before the month closes, and as the allotment of 2,500,000 tons for June is considered moderate it is thought that the demand will keep pace with the supply. In this respect the new arrangements are regarded by the trade with satisfaction, as there is said to be little accumulation at tide-water points, and the companies are assured a reasonable profit in their business, whether mining or transporting. Much is predicted of the reorganized Coal department of the Pennsylvania Railroad Co., with its enlarged corps of accountants and new extensions in the Coal regions, and the influence of that corporation will doubtless be more felt in the market, especially West and South. The Philadelphia *Ledger* says: "The Pennsylvania Railroad's Coal and Coke traffic, we believe, is the largest of any railroad in the country, without exception. In 1885 the total tonnage of Coal and Coke passing over the Pennsylvania Railroad division of that company's lines amounted to 14,281,900 tons, of which 11,579,596 tons were Coal and 2,702,313 tons Coke. Thus far this year the shipments over the same division have reached nearly 5,000,000 tons, of which about one-fourth was Coke, being an increase of nearly 400,000 tons of which nearly 300,000 tons were Coal and over 100,000 tons Coke. We understand, however, that every effort will be made by the company to market its full

"allotment." Scranton Broken and Egg are quoted \$3.15 at Hoboken. Stove, \$3.55; Nut, \$3.30; Pittston, at Newburg, Broken and Egg, \$3; Stove, \$3.45; Nut, \$3.35; Pea, \$2.15. Now that the fears of a strike about May 1 have subsided, it is not likely that new business will offer as freely as a while ago.

In the Bituminous trade prices are easier from week to week, but the labor question remains unchanged, both sides holding their positions. Quotations are \$3.75 @ \$4.25, but some Coal is sold as low as \$3.50.

The total amount of Anthracite Coal sent to market for the week ending May 1, as reported by the several carrying companies, was 373,792 tons, compared with 301,178 tons in the corresponding week last year, an increase of 72,614 tons. The total amount of Anthracite mined thus far in the year 1886 is 9,862,450 tons, compared with 8,024,198 tons for the same period last year, an increase of 1,838,252 tons.

The Production of Iron and Steel in Sweden.

The Journal of the United States Association of Charcoal Ironworkers prints the following tables on the production of iron and steel in Sweden:

Production in metric tons.	1882.	1883.	1884.
Iron ore	992,863	885,124	900,558
Pig iron	368,945	422,627	430,584
Iron in rods, bars, &c.	259,462	255,358	264,944
Cast iron and steel	47,800	16,700	53,120
Other kinds of steel	1,430	1,887	1,754
Plates	15,865	17,439	17,534
Nails	8,148	8,197	9,290
No. of furnaces in blast	185	191	178
Average length of blast of each furnace—day	217	216	227
Average daily production of each furnace in metric tons	9.98	10.25	10.67

Exports from Sweden.	1882.	1883.	1884.
Metric tons.	1882.	1883.	1884.
Iron ore	90,300	82,519	40,000
Pig iron	85,500	52,126	55,000
Blooms	8,000	6,258	5,500
Iron in rods, bars, &c.	208,000	194,639	196,000
Plates of all kinds	2,300	2,173	2,400
Nails	900	827	1,800
Ingots iron & steel	9,800	11,214	10,500
Iron and steel in bars, rods, &c.			4,158

The average product per furnace for the year 1885 was 56,901 centner = 2666.17 tons of iron ore produced in 1884 there were employed 5165 laborers on steady work, 514 on occasional work, and 602 women and children. The blast furnaces gave employment to 4133 laborers, and the forges required the services of 7627 men.

Joint Stock Companies in England.—According to Prof. Leone Levi there were registered in England from 1862 to 1884, 23,140 joint stock companies, with a nominal capital of £2,710,000,000. Yet in 1883 the number in existence was 8383 companies, with a capital of £467,000,000. From 1862 to 1884 as many as 14,302 companies, with a nominal capital of £2,243,000,000 had disappeared from the register. What amount of capital had been lost in abortive companies was difficult to estimate. Assuming that 5 per cent. had been paid up on the whole amount, and that the half that had been returned, the loss would amount to £55,000,000 in the 22 years, not all of which was perhaps wasted, but only diverted from productive to unproductive labor. Many of the joint stock companies were for small concerns, and many were formed to take over the business of private firms; but the terms demanded or offered were far in excess of their real worth. Comparing the dividends made by 216 companies for the great variety of business quoted at the Stock Exchange, it was found that the average was 6.97 per cent. per annum in 1880, and 6.94 per cent. in 1884. Taking the amount of profits assessed to income tax on public companies in relation to their capital in 1884, the proportion was 6.85 per cent., while the profits assessed on railways were on the net receipt of 4.12 per cent., giving an average on the whole amount of 5.17 per cent.

New York Metal Exchange.—At their last meeting the Board of Managers of the Metal Exchange adopted several new rules, to go into force on the 17th inst., which will materially affect business at the Exchange, it is generally thought favorably. The morning call has always been held at 11.30 a.m., and as complaints have been made that it delayed business unnecessarily late in the day, and at the same time diverted from the Exchange to the street many transactions which could not be kept waiting until the regular opening, the managers have now decided to change the call-hour to 10.30 a.m. The margin rules, which at present specify a fixed rate of original margin for each metal, which cannot be exceeded or decreased, have been amended by naming these amounts as maximum rates only, the parties to a contract having the privilege to deposit as much less as they may mutually consent to. The rate on pig iron, which is now \$2 per ton, will hereafter be a maximum of 10 per cent., which at present value would equal \$1.70 per ton. Messrs. Edward Barr, Stuyvesant Wainwright and Clarence C. Andrews have been elected members of the Exchange.

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Hardware Novelties.

Carter's Filters and Coolers.

James Carter, 112 Market street, Lockport, N. Y., is the manufacturer of Carter's patent water filters and coolers, two styles of which are shown in the accompanying illustrations. Fig. 1 is a sectional view of Carter's Stoneware Filter and Cooler. The ice chamber extends through the center of the cooler, and at the lower end is surrounded by the water receptacle, as shown. The ice chamber is of Britannia metal, said to be absolutely non-corrosive. The water collected from the melting ice is not allowed to mingle with the water which has been filtered, but is drawn off by a separate pipe and faucet at the bottom. All impurities which may be present in the ice are thus prevented from contaminating the water used for drinking and culinary purposes. The water reservoir which surrounds the ice chamber is bell-shaped and is made of stoneware, which, being non-corrodible, will not in any way injure the quality of the water. The water enters the bell around the lower edge after having passed through the filtering material, and is drained off at the center of the bottom. At the left of the ice chamber, as shown in the cut, is an air tube which admits air into the top of the water reservoir and prevents the formation of a vacuum. The water being inclosed on all sides and not being open to the air, it is claimed that it will remain unchanged and fresh, and so need not be emptied daily, as is the usual custom. To enter the reservoir the water

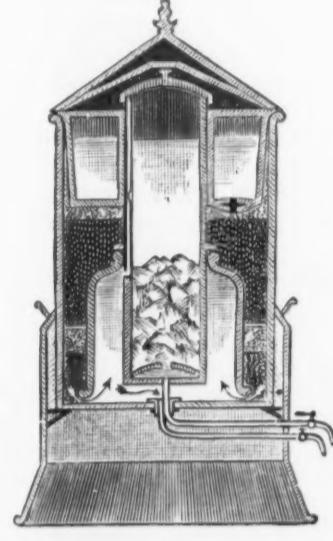


Fig. 1.—Sectional View of Carter's Stoneware Filter and Cooler.

has to percolate through the whole depth of filtering material which, as shown, extends about half the depth of the cooler. The filtering material used is white Rockaway sand and specially prepared charcoal. Before passing through the filter the water is first partly purified and the impurities held in suspension removed by means of a sponge-cup. The principal reason for the use of

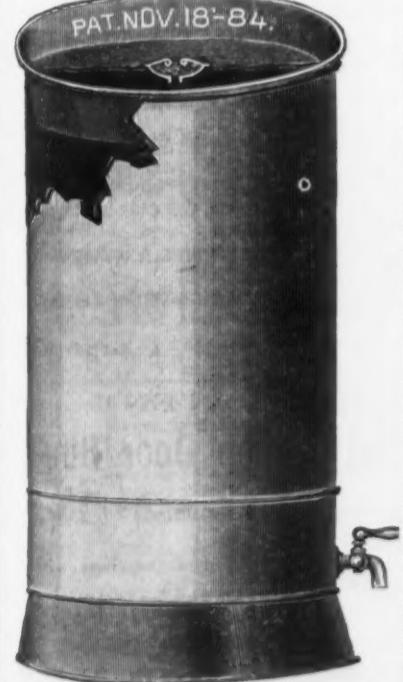
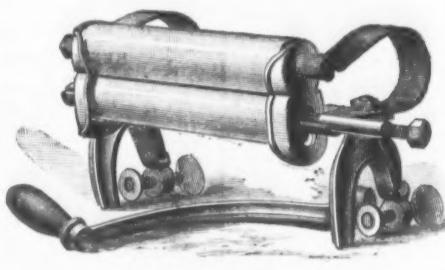


Fig. 2.—Carter's Common-Sense Stoneware Family Filter.
The sponge-cup is that it prevents the clogging of the filtering material and renders frequent repacking unnecessary. It also allows of the closest packing of the filtering material and thus insures a better purification of the water. Surrounding the lower part of the cooler is a metal base which is packed with non-conducting material to maintain the water at a low temperature without a wasteful use of ice. Fig. 2 shows Carter's Common Sense Stoneware Family Filter, which is made without a cooler and is intended for household and cooking purposes where a large amount of filtered water is required. It is of larger capacity than the filter and cooler, but is made of the same material throughout.

The Superior Wringer.

The Bailey Wringing Machine Co., Woonsocket, R. I., are making the Superior Wringer, an illustration of which is given in the accompanying cut. It will be seen

that it is an iron-frame wringer, the general construction and operation of which require little explanation. Special emphasis is laid upon the quality of the springs, which are made by the company of a special grade of English steel, and are carefully tempered and tested before they are applied to the wringers. The rolls are described as of the best white rubber, vulcanized by a special process. The crank is made of malleable instead of cast iron, and is attached by a new method, as the shaft has two threads, the crank going on by a right-hand turn, the



The Superior Wringer.

not following by a left-hand turn, thus permitting a backward or forward movement without any liability of unfastening the handle. The clamps by which the wringer is attached to the tub are swiveled, so as to permit their ready adjustment to the varying size and thickness of tube, and, if desired, are furnished extra large for use on stationary tubs of heavy wood. In manufacturing this line of wringers the company have aimed to maintain the quality, workmanship and finish of their wood-frame wringers, and each wringer is sent out with a guarantee upon it warranting it in every respect and authorizing dealers to take back or exchange any found defective. These wringers are made in three sizes—No. 2, small family size, rolls 10 inches long; No. 3, medium family size, rolls 11 inches long; No. 4, large family size, rolls 12 inches long.

Moulton's Lemon Drill.

The accompanying cut represents this article, which is made by W. F. Moulton, Burlington, Vt. Its purpose is to extract the juice from lemons, and it is intended to take the place of the conventional squeezers. It is about 6 inches in length and consists of a wooden handle in which two pieces of tin, formed as represented in the cut, are inserted. The method of operation is simple: The end of the lemon is pared, so as to provide an entrance for the drill, which is then inserted and rotated, the juice and pulp freed and extracted. It will be observed that there is a slot cut in the handle to



Lemon Drill.

prevent the juice from running down the handle when the drill is in use. The efficiency of its working is referred to by the manufacturer, while its inexpensiveness is another point in its favor.

The Explosion of Gaseous Mixtures.

From a paper on "The Explosion of Homogeneous Gaseous Mixtures," recently presented to the British Institution of Civil Engineers, by Mr. Dugald Clerk, we take the following interesting facts and figures:

Experiments were made by Hirn in 1861 to determine the pressures produced by the explosion of mixtures of inflammable gases with atmospheric air. The pressures of the explosions were much lower than calculations gave, assuming that the maximum pressure of the explosion was coincident with the complete combustion of the gas. For a mixture of one volume of hydrogen and nine volumes of air, calculation gave 5.8 atmospheres, whereas experiment only showed 3.25 atmospheres. Coal gas behaved in a similar way. Bunsen's experiments, made in 1866, corroborated Hirn's results, and went a step further by proving that the heat was not all evolved, even when the vessel was completely filled with flame; that was, the deficiency of pressure was not due to the burning out of the flame at one part before ignition occurred in the other part of the vessel. More recently a series of papers had appeared describing numerous experiments by Messrs. Mallard and Le Chatelier, in all of which experiments a large deficiency of pressure was observed. Messrs. Berthelot and Vieille also supported their conclusions.

The author had made the experiments described in this paper, partly to obtain much needed data for gas-engine work, and partly to study more fully the nature of the actions occurring during explosion. His experiments corroborated those of previous workers in proving indisputably the existence of the limit to increase in pressure, the deficiency in pressure being very great, seldom more than one half of the heat of the explosion being evolved at the moment of maximum pressure. The explosion vessel used by the author was a cast-iron cylinder, the internal space being 7 inches in diameter and 8½ inches long. Upon the upper cover was mounted a Richards indicator, from which the ordinary reciprocating drum had been removed and a revolving one substituted, driven by a falling weight and suitable gear; a fan moving at a high velocity served as governor. The revolving drum was enameled, and a soft blacklead pencil held by the indicator motion marked upon it a line caused by the movement of the indicator piston. A pair of insulated points projected through a plug in the bottom cover and served to ignite the mixture when a spark from a coil and battery was passed between them. The line traced on the drum by the indicator showed the amount of rise in pressure and the times of rise and fall in

terms of revolution of the drum. The tracing was precisely analogous to the indicated diagram from an engine. The rising line was due to the explosion, the falling line was due to the cooling action of the cold walls upon the hot gases. The tracing was in fact a record of the rapidity, intensity and duration of an explosion. Careful tracings were made, which were reproduced. Tables were given of the results obtained from various mixtures of air with Glasgow coal gas, Oldham coal gas and pure hydrogen:

Glasgow Coal Gas and Air Mixtures.
Temperature of Gases before Ignition, 18° C., Pressure, Atmospheric (14.7 Pounds).

Experiment.	Proportion of gas by volume.	Mean pressure.	Maximum temperature, Centigrade.	Time of explosion.
a	1 52 lb. per sq. in. above atmos.	1047	0.28	deg. sec.
b	1-12 68 lb. per sq. in. above atmos.	1305	0.18	
c	1-10 69 lb. per sq. in. above atmos.	1304	0.13	
d	1-4 89 lb. per sq. in. above atmos.	1780	0.07	
e	1-6 96 lb. per sq. in. above atmos.	1918	0.03	

Oldham Coal Gas and Air Mixtures.
Average Temperature of Gases before Ignition, 17° C., Pressure, Atmospheric (14.7 Pounds).

Experiment.	Proportion of gas by volume.	Maximum pressure.	Maximum temperature, Centigrade.	Time of explosion.
a	1-15 40.0 lb. per sq. in. above atmos.	80.6	0.45	deg. sec.
b	1-14 51.5 lb. per sq. in. above atmos.	90.3	0.31	
c	1-18 60.0 lb. per sq. in. above atmos.	1303	0.24	
d	1-12 61.0 lb. per sq. in. above atmos.	1220	0.17	
e	1-10 78.0 lb. per sq. in. above atmos.	1557	0.06	
f	1-6 87.0 lb. per sq. in. above atmos.	1733	0.04	
g	1-6 91.0 lb. per sq. in. above atmos.	1792	0.04	
h	1-6 91.0 lb. per sq. in. above atmos.	1812	0.035	
i	1-5 80.0 lb. per sq. in. above atmos.	1595	0.16	

Hydrogen and Air Mixtures.
Temperature of Gas before Ignition, 16° C., Pressure, Atmospheric (14.7 Pounds).

Experiment.	Proportion of hydrogen by volume.	Maximum pressure.	Maximum temperature, Centigrade.	Time of explosion.
a	1-7 41 lb. per sq. in. above atmosphere	825 to 900	0.15	deg. sec.
b	1-5 68 lb. per sq. in. above atmosphere	1358 to 1539	0.026	
c	2-7 80 lb. per sq. in. above atmosphere	1615 to 1929	0.01	

From these experiments the relative value of the different mixtures of gases for producing power might be calculated. In Glasgow gas, the most economical mixture for non-compressive engines was 1 volume of gas to 11 volumes of air; Oldham gas, 1 volume of gas to 12 volumes of air. Comparing Glasgow gas and Oldham gas, the pressure of the former was longer sustained than that of the latter, and the pressures produced for a given volume were equally good; therefore more power was obtained from a cubic foot in Glasgow than in Oldham. Pure hydrogen, which was very commonly thought to be the best, was shown to be the poorest. An engine which would indicate 10 horsepower with coal gas would not indicate more than 3.7 horsepower with pure hydrogen. The author's results were in complete accord with those of previous experimenters on the question of the existence of a limit; in no case did the heat accounted for by the explosion pressure amount to more than 77 per cent. of the total heat present as inflammable gas; in the majority of cases it was a little over 50 per cent. In the author's opinion, no single theory previously stated accounted for all the phenomena of these explosion curves. Although all experimenters were agreed upon the fact of the deficiency of pressure, they differed upon the causes producing this result. Three theories had been propounded:

Theory of Limit by Cooling.

This was Hirn's theory. It supposed that when explosion occurred a point was attained when the cooling effect of the inclosing walls was so great that heat was abstracted more rapidly than it was evolved, and accordingly the combustion, although continuing, did not proceed with sufficient rapidity to prevent fall of pressure.

Theory of Limit by Dissociation.

This was Bunsen's theory, and was undoubtedly very largely true. The fact that no unlimited temperature could be attained by combustion was so conclusively established, both by science and by practice, that gradual combustion from that cause might be safely taken as occurring at the higher temperatures of gas-engine explosions. There was, however, a difficulty in applying it to all cases. In an experiment with Oldham coal gas, when the maximum temperature of the explosion was 806° C., the apparent loss of heat was 65 per cent., while in an explosion with a maximum temperature of 1733° C., the apparent loss of heat was only 38 per cent. With hydrogen mixtures the same thing occurred:

Per cent.
Maximum temperature, 900° C., apparent evolution of heat..... 55
Maximum temperature 1700° C., apparent evolution of heat..... 54

If dissociation entirely explained the limit, then, as water and carbonic acid must be dissociated more at the higher than at the lower temperature, the deficiency should be greater at 1700° C. than at 900° C. It was not so. Some other cause than dissociation must therefore be acting to check the increase so powerfully at the lower temperature. The problem was more complex than had been hitherto supposed.

The Theory of Limit by the Increasing Specific Heat of the Heated Gases. According to Messrs. Mallard and Le Chatelier, the specific heat of nitrogen, oxygen and the compounds formed by combustion increased greatly at the higher temperatures; dissoci-

ation acted only to a trifling extent below 1800° C. The heat of combustion was all evolved at the maximum temperature of the explosion; but as the specific heat changed calculation from the specific heat at ordinary temperatures was erroneous. The deficiency of pressure was therefore a measure of the increased capacity for heat of the reacting gases. The crucial point of this theory was the supposition that combustion was completed at the maximum temperatures; if it could be shown that combustion was not complete, then the whole theory fell to the ground. The author's experiments seemed to him to prove conclusively that combustion was incomplete; this has been done by a study of the curves of the rates of cooling of various explosions.

Fuller Account of the Phenomena During Explosions.—In the author's opinion no single cause explained the limit in all cases of explosion. The actions operating were much more complex than had been generally supposed. To him it seemed that much confusion had arisen through neglecting to distinguish properly between two distinct and separate phenomena which occurred during explosion. These phenomena were the inflammation or filling of the explosion vessel with flame, and the completion of the burning which was so originated. The explosion curves with coal gas showed some extraordinary features: in many cases an actual check seemed to occur in the rising curve, lasting for some time, followed by an increase of pressure, but at a slower rate than before the check. It was noticeable that the strongest mixtures showed it most distinctly. The hydrogen curves exhibited no such check. It seemed, then, that not only might combustion be incomplete when the vessel was filled entirely with flame, but the pressure at that time might not have attained its maximum, and might continue to increase rapidly after that point.

Why did the pressure again increase after the pause in the explosion curve? The author suggested what he considered a sufficient explanation. In an ordinary fire-grate a name communicated to the coal at one point gradually spread till the whole was incandescent. The solid coal might be every part of it burning, and yet a further accession of air would cause it to glow more brightly—that was, to increase in temperature. Explosions had often occurred in flour mills and in coal mines from the diffusion throughout the air of minute combustible particles of flour and of coal dust. If present in suitable quantity, a flame applied at one part caused an explosion. It by no means followed, however, that complete inflammation coincided with maximum pressure; the pressure might still increase.

In coal-gas explosions the flame had filled the vessel before any check had occurred, and then the hydrocarbons decomposed, causing a pause, which gave way to increase when the hydrogen and carbon so liberated combined with the free oxygen. In all chemical combinations dilution caused slowness of action, and dilution during a reaction by the products formed made the last part of the action slower than the first.

Conclusions.—1. Messrs. Mallard and Le Chatelier's theory of increased specific heat of the gases—nitrogen and oxygen—at high temperature was, in the author's opinion, erroneous.

2. Dissociation probably occurred at the higher temperatures to a considerable extent, but it was not the sole cause imposing a limit to increase of pressure.

3. Combustion was very similar to other chemical actions, the first part of the reaction occurring rapidly, and proceeding with increasing difficulty as the combination approached completion.

4. The explosion vessel was entirely filled with flame before the combustion was complete.

5. The limiting causes acted after the flame had spread completely.

6. The limiting causes in weak mixtures were diminution in the rate of burning as the reaction approached completion and consequent limits by cooling. Combustion caused the heat to be evolved at rates greater than, equal to, and less than, the rate of cooling.

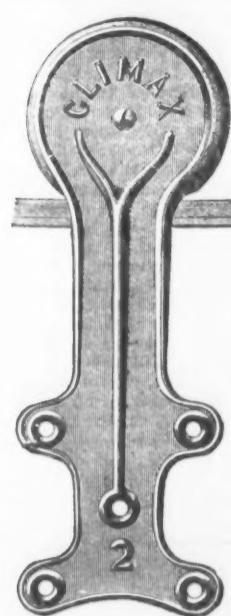
The Provident Benefits of English Trades Unions.

An English exchange has the following on the beneficial feature of trades unions:

Further evidence of the great advantage, even from a national point of view, of the provident benefits of trades unions—which is especially gratifying in these depressed times—is afforded in the report for last year of the Amalgamated Society of Carpenters and Joiners. This association, which has its headquarters in Manchester, covers the whole of the United Kingdom, as well as portions of the United States, Canada, Australia, New Zealand and South Africa. In 1885 it dispensed to the unemployed, £34,900; to the sick, £16,719; for funerals, £2913; for superannuation, £2581; for accidents, £1750, and in contingent and benevolent grants, £1051. We have thus a total of £59,923 spent in the relief of members in one shape or another. Since June, 1860, the amount disbursed for the direct benefit of individual members, £566,924, while not more than £73,164 have been spent for the support of trade movements—that is to say, in wages and other kindred contests. The claims upon the society for the support of those who are out of work simply in the ordinary course, and not through strikes, have naturally been very heavy during the past year. But the proportion of members unemployed, even so lately as on January 31 last, was not so great as it was on the corresponding date in 1881.

Partly, if not entirely, this apparent advantage in favor of the present year is illusory. It is evidently due, more or less, to the fact that since 1881 there has been a very important increase of membership. Indeed, to make the comparison quite accurate, we ought to go back to the figures for 1880, which show that there were then 17,764 members. In 1885 there were 25,781, the increase in the interval having been not far from 50 per cent. Now, it is well known that apprehensions of a season of bad trade tend to augment the roll of membership at

an unusual rate through fear of coming trouble, and the present number of the unemployed to the whole body of workpeople in this industry is probably, therefore, at present absolutely greater than it has ever been, although the proportion of the actual members of the society so situated is undoubtedly less than it was five years ago. Still the proportions given in the report are very instructive. They show that in 1876 the number out of work was 16 per 1000 members; in 1877, 26; in 1878, 42; in 1879, 187; in 1880, 131; in 1881, 191; in 1882, 68; in 1883, 81; in 1884, 77; in 1885, 108, and in 1886, 180. Referring to the present prospect in the building trades, the secretary, expressing simply his own view, says that he does not think that there is such a falling off of activity as to give ground for serious alarm. The severity of the past winter has, he states, exceptionally intensified the present pressure, and with the return of good weather he anticipates



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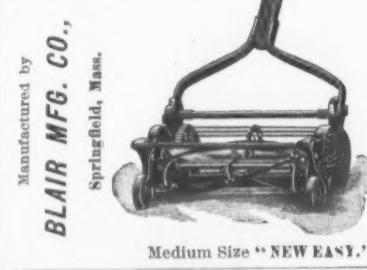
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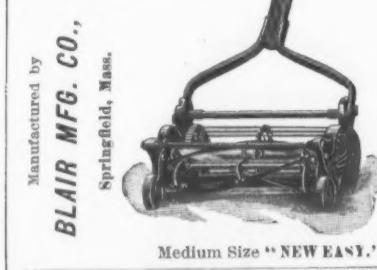
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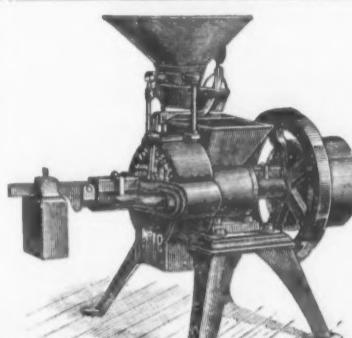


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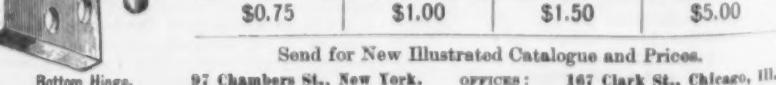
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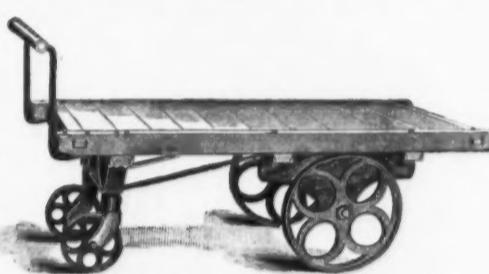
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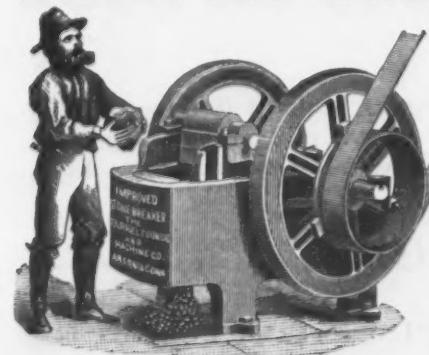
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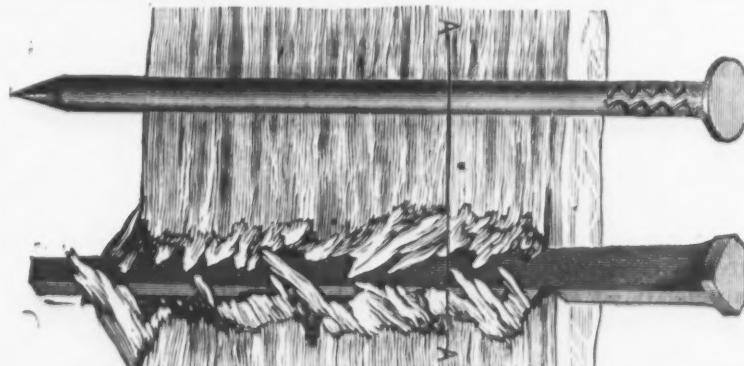
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Bauerman.—Metallurgy of Iron. By H. Bauerman; 5th edition, revised and enlarged, 58 illustrations, 515 pages, 12mo, cloth \$2

This work treats of the physical properties of iron ores, and the most approved means of reducing them to the purposes of the manufacturer. The methods of assay and analyses of iron ores are practically considered, as also their composition and distribution. The subject of blast furnaces, their capacity and production, has also received careful attention. In the present edition the author has added to the chapter on Steel Making, and has explained and illustrated the progress recently made in the process of steel manufacture, both of Siemens and Bessemer, especially the latter, by the adoption of lime as a dephosphorizing agent. The book also contains a chapter on the mechanical properties and tests of Malleable Iron and Steel. The author has succeeded in his avowed attempt to supply much practical and reliable information for ironworkers and others, in condensed form.

Bayley.—The Assay and Analysis of Iron and Steel, Iron Ores and Fuel. By Thomas Bayley; 17 illustrations, 91 pages, 12mo, cloth \$1.40

This little book is a reprint, with some additions, of a series of articles which have appeared in the *Mechanical World* (England). It is intended for practical men possessing some knowledge of chemistry as well as for students of chemistry in general. The methods of analysis described have been personally tested by the author in his extensive practice. A table of the atomic weights as calculated by Mr. F. W. Clarke is included.

Greenwood.—Steel and Iron. Comprising the practice and theory of the several methods pursued in their Manufacture, and of their treatment in the Rolling Mill, the Forge and the Foundry. By W. H. Greenwood; 97 illustrations, 536 pages, 12mo, cloth \$2

This work satisfactorily presents in convenient form the most important processes employed in the manufacture of iron and steel. The illustrations are in most cases reduced from actual working drawings. The style is simple and clear. Although many of the recent improvements in American practice have not received the thorough attention which they merit, the book treating more particularly of English practice, the author has succeeded in producing a comprehensive manual for the technical student, and an intelligible and valuable assistant to the practical iron-worker. The chapter headings are as follows:

Explanation of Terms; Refractory Materials, Crucibles, &c.; The Ores of Iron; Metallurgical Chemistry of Iron; Cast or Pig Iron; The Production of Pig Iron; The Blast Furnace; Hot-Blast Stoves, Hoists, Lifts, &c.; Fuel, Blast, Charges, Yield and Waste Gases of the Blast Furnace; Castings in Iron, Foundry Appliances, &c.; Malleable or Wrought Iron; The Production of Malleable Iron Direct from the Ore; Indirect Methods for the Production of Malleable Iron; The Production of Malleable Iron in Open-Hearth Furnaces; Refining of Pig Iron; Puddling; Mechanical Puddling and Rotary Puddling Furnaces; Forge and Mill Machinery, Furnaces, Plant, and Operations; Steel and Ingot Iron; The Methods Employed in the Production of Steel Direct from the Iron Ore and by the Carburization of Malleable or Bar Iron, by the Decarburization of Pig Iron in the Finery or in the Puddling Furnace, by the Fusion of Pig Iron with Malleable Iron or with Iron Ores in the Open-Hearth Steel-Melting Furnace; The Bessemer or Pneumatic Process for the Production of Steel from Pig Iron; The Basic Process for the Conversion of Phosphoric Pig Iron into Steel in the Bessemer Converter; The Production of Homogeneous Steel Ingots, Fluid Compression of Steel, Compound Armor Plates, &c.

Bell.—Principles of the Manufacture of Iron and Steel, with Some Notes on the Economic Condition of Their Production. By I. Lowthian Bell, F.R.S.; 10 full-page plates, 744 pages, 8vo, cloth \$6

This extended and comprehensive treatise is an outgrowth, as stated by the author in his introductory chapter, of a request, from the British Iron Trade Association, to prepare a report on the present condition of the

manufacture of iron and steel as illustrated by the objects displayed at the French International Exhibition of 1878, in Paris. This work contains not only the general results arrived at, but also more extended investigations and experiments which it was considered necessary to pursue to thoroughly discuss the subjects under treatment. The appended headings of the 18 sections into which the volume is divided will give an idea of its scope:

Section I. Introductory. Section II. Historical. Section III. Direct Processes. Preliminary Treatment of Materials for the Making of Malleable Iron. Section IV. for Blast Furnace. Section V. The Blast Furnace. Section VI. On the Use and Theory of the Hot Blast. Section VII. On the Quantity and Quality of the Fuel Required in the Blast Furnace Using Air of Different Temperatures. Section VIII. On the Solid Products of the Blast Furnace. Section IX. Chemical Changes as They Take Place in the Blast Furnace. Section X. On the Equivalents of Heat Evolved by the Fuel in the Blast Furnace. Section XI. On Hydrogen and Certain Hydrogen Compounds in the Blast Furnace. Section XII. On the Production of Malleable Iron from Pig Iron in Low Hearths. Section XIII. On the Refining and Puddling Furnace. Section XIV. On More Recent Methods of Separating the Substances Taken Up by Iron During Its Passage Through the Blast Furnaces. Section XV. Statistical. Section XVI. British Labor Compared with That of the Continent of Europe. Section XVII. On Labor in the United States of America. Section XVIII. Chief Iron-Producing Countries Compared.

West.—American Foundry Practice. By Thomas D. West; illustrated, 391 pages, 8vo, cloth \$2.50

A practical treatise on the management of cupolas and the melting of iron. The author, a practical foundryman, treats of the molder and his trade, green-sand molding; loam and dry-sand molding, and the manipulation of iron castings. The work is a valuable addition to the list of books upon this subject.

West.—Moulder's Text Book; being Part II of American Foundry Practice. By Thomas D. West; 146 illustrations, 461 pages, 8vo, cloth \$2.50

This volume, in connection with the author's previous work, entitled "American Foundry Practice," affords a thorough presentation of the latest and best methods of foundry practice. Beginning with articles on sand casting and defects in structural castings, the various chapter headings include Progress in Molding; Novelties in Foundry Practice; Geometry in the Foundry; Procuring Clean-Finished Castings from Dry Sand and Loam Molds; High Art Molding in Loam and Dry Sand; Manipulating of Cores; Procuring Clean-Finished Castings from Green Sand Molds; Methods and Rules for Green Sand and General Molding; Elements and Manufacture of Foundry Facing; Welding Steel to Cast Iron and Mending Cracked Castings; Foundry Addition; Ovens and Pits; Ladle and Casting Carriage Combined; Making Chilled Rolls and Roll Flask, Runners and Gates; Molding Machines; Equivalent Areas for Round, Square and Rectangular Pouring Gates; Errors in Figuring Weights of Castings; Utilizing Cast Steel Scrap; and several contributed chapters on melting small quantities of iron, making a curved pipe from a straight pattern, making pipes on end in green sand, three ways of making an air vessel and a method of molding gear-wheels. The subjects of Cupolas and their Construction, and the Melting of Iron, are extensively treated. There are also included 46 reports of cupola workings collected from 30 States. Each firm's name and the line of castings made are given, making these reports valuable in giving so many different men's ideas and practices in mixing and melting iron.

Weeks.—Report on the Manufacture of Coke. By Jos. D. Weeks, Special Agent; 26 (mostly full-page) illustrations, 114 pages, quarto. Paper, \$1.50; cloth, \$2.

As stated by the author, this report embraces the complete statistics of the production of coke during the census year 1880, together with such information regarding the characteristics of the works, material used and labor employed, as could be obtained. The work is divided in five parts. Part I is entirely statistical. The coal fields and coal of the United States in their relation to the manufacture of coke in the census year is discussed in Part II, together with the history of coke manufacture in the several states individually. Part III treats of the materials included and a complete classified index accompanies the work.

subjects of coal and coal washing are considered, and the properties, composition and analyses of European and American coals are discussed. Part V includes in detail descriptions of the various methods of coking: first, in piles or mounds; second, in rectangular kilns having brick or stone sides, and entirely open at the top; and, third, in closed kilns or ovens of brick and stone, together with the special adaptions of each form of oven to the coals of different localities. Full information is given as to the utilization of waste products. The illustrations include maps of the coke-producing belt, the Connellsburg coke region, the New River of Kanawha coking coal field, and cokes of kilns, ovens and coking machinery.

Kirk.—Founding of Metals. By Edward Kirk; 5th edition, 21 illustrations, 272 pages, 8vo, cloth \$2.50

This work contains the observations and experience acquired in the ten years' practice of a practical foundryman and chemist. The subjects of the mixing and melting of iron and the construction and management of cupolas and furnaces are treated upon at length. The founding of alloys is also considered, together with a general description of all the metals, minerals and gases used in the art of founding. A feature of the book which will commend it to the practical workman is the avoidance of the chemical and technical terms usually applied to this subject.

Thurston.—Materials of Engineering. By Robert H. Thurston, C. E., Professor of Engineering, Stevens Institute of Technology.

Part II, Iron and Steel; 143 illustrations, 680 pages, 8vo, cloth \$5

In this, the second volume of Professor Thurston's important work on the materials of engineering construction, the author has included a large amount of practical information not heretofore available without consulting many different authorities. The ores of iron, their classification, analysis and reduction have received thorough treatment. The construction and management of blast furnaces and the different operations connected therewith are comprehensively detailed. The subject matter comprehends all the practical operations employed in the manufacture of iron and steel, so simply expressed as to be readily understood by those of limited education. There are several chapters upon the strength, elasticity and resistance of the metals treated, under the effects of time, temperature and repeated strain, with the necessary formulas and diagrams. The work is valuable not only as a text-book for the student and engineer, but equally so as a work of reference for the manufacturer and mechanic. Considerable space is given to the most approved methods of manufacturing malleable iron, and the tests of iron and steel are carefully considered and illustrated by recent examples.

Thurston.—Materials of Engineering; Part III. Non-Ferrous Metals and Alloys. By Prof. Robert H. Thurston; illustrated, 575 pages, 8vo, cloth \$4

This is the concluding volume of a work in three parts designed for engineers, students and artisans in wood, metal and stone. Part I discusses the non-metallic materials of engineering. Part II is entitled "Iron and Steel." In the present volume the history, general processes and properties of the metals and their alloys are considered in Chapter I. In Chapter II the non-ferrous metals, copper, tin, zinc, lead, antimony, bismuth, nickel, aluminium, platinum, mercury, &c., are specially described, together with their sources, distribution and methods of reduction. The remaining twelve chapters treat in detail upon the properties of alloys, chemical and mechanical; the bronzes and brasses, their composition and uses; the calchoids, or copper-tin-zinc alloys, and the other miscellaneous alloy; the manufacture and working of alloys; the strength and elasticity of non-ferrous metals; strength of brasses and other copper-tin alloys; strength of brasses and other copper-zinc alloys; strength of calchoids and other copper-tin-zinc alloys; conditions affecting strength, such as heat, change of temperature, effects of stress; and the mechanical treatment of metals and alloys; 96 tables of tests of the different materials are included and a complete classified index accompanies the work.

Weeks.—Report on the Manufacture of Coke. By Jos. D. Weeks, Special Agent; 26 (mostly full-page) illustrations, 114 pages, quarto. Paper, \$1.50; cloth, \$2.

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Mullin.—Modern Moulding and Pattern-Making; A Practical Treatise Upon Pattern Shop and Foundry Work. By Joseph P. Mullin, M. E.; 165 illustrations, 257 pages, 8vo, cloth \$2.50

This book embraces the molding of pulleys, spur gears, worm gears, balance-wheels, stationary engine and locomotive cylinders, globe-valves, toolwork, mining machinery and the latest improvements in English and American cupolas. A number of practical tables for general use are included, such as Tables of weights and measures of round, T and bar iron, and diameters, circumference and all circles, and of the proportional radii of wheels.

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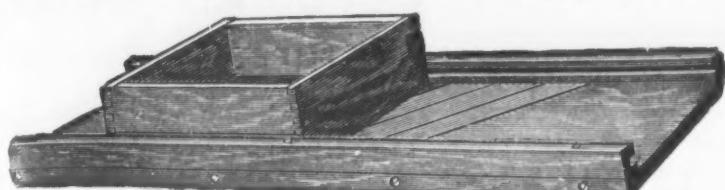
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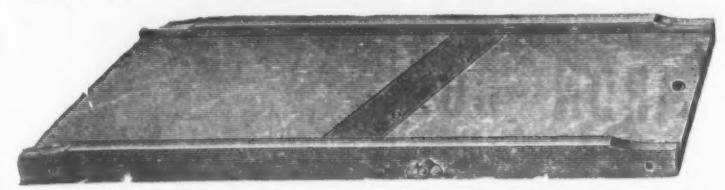
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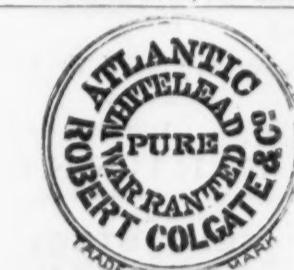


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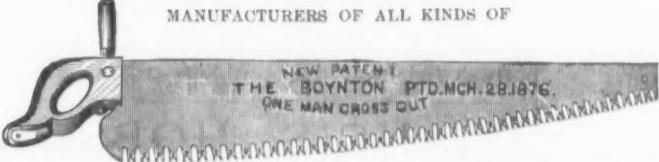
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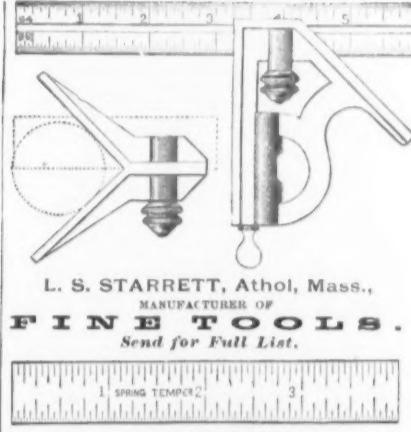
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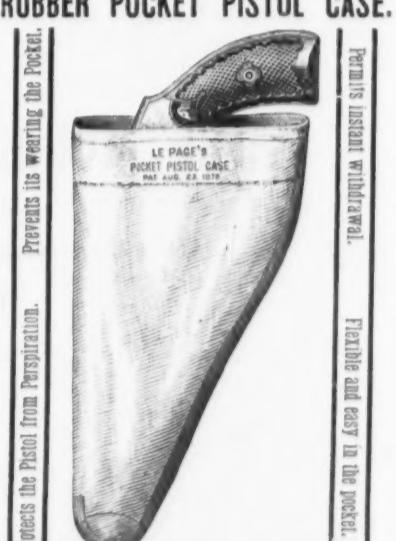
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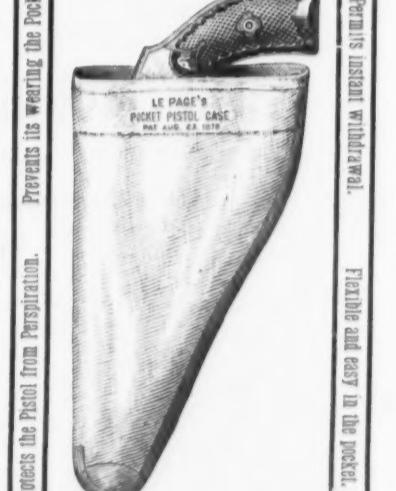
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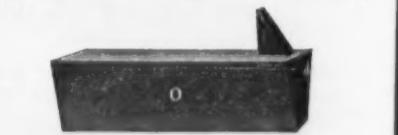
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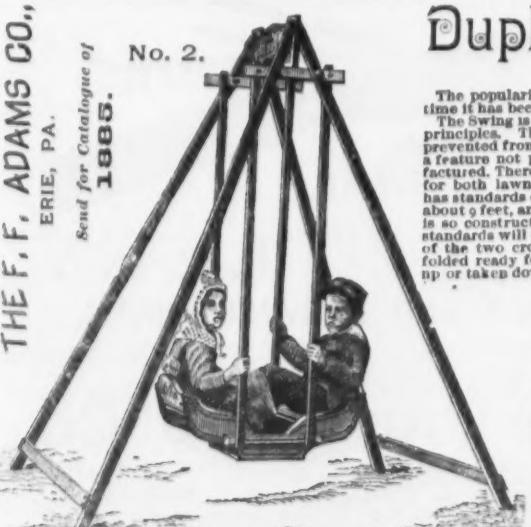


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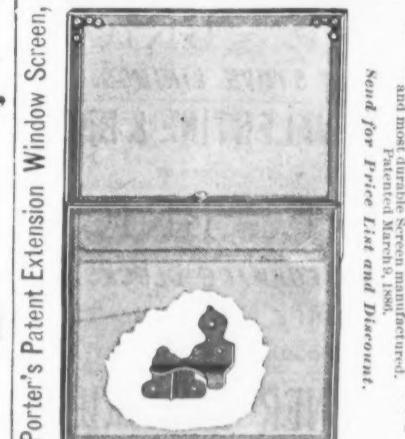
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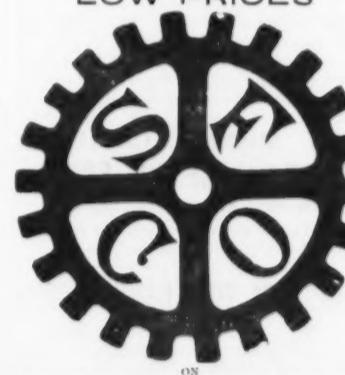
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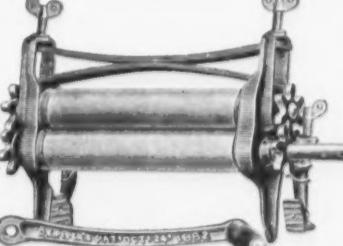
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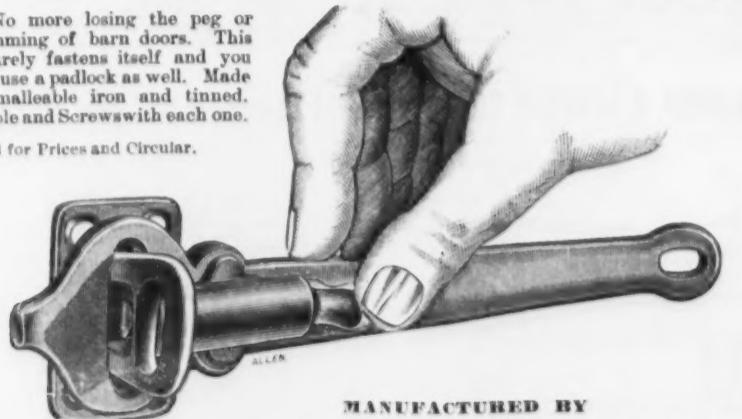
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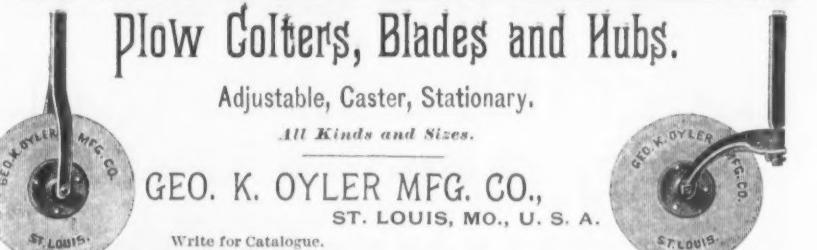
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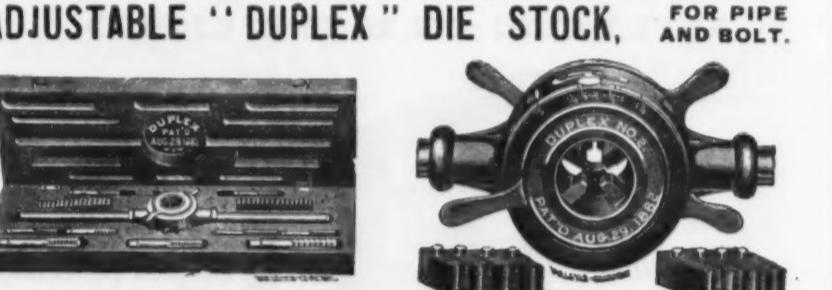
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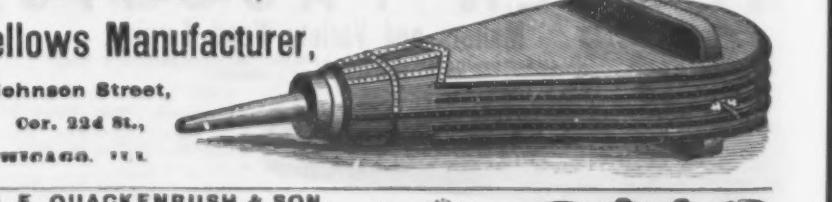
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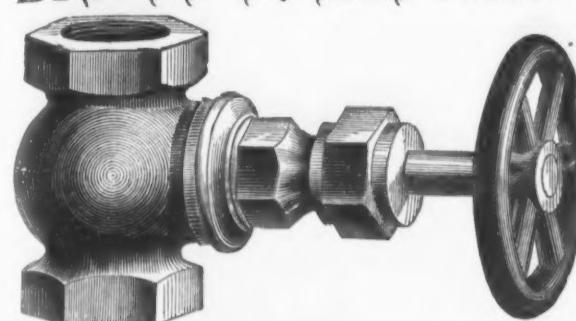
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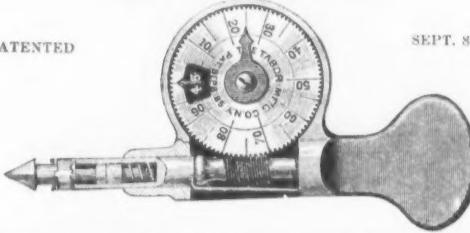
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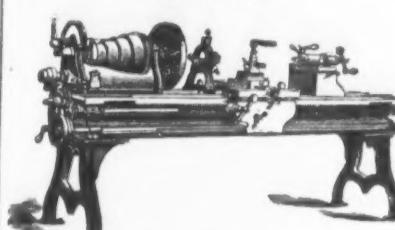
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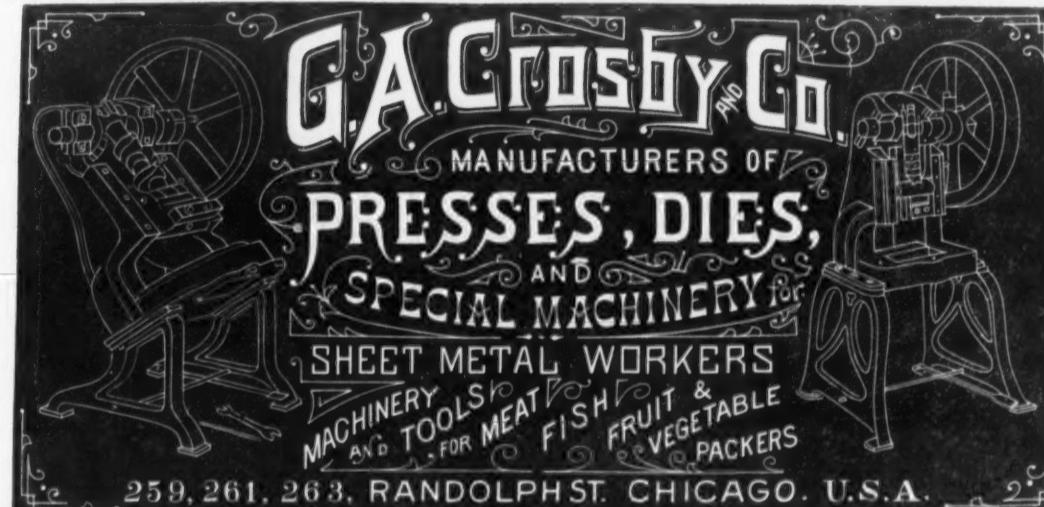
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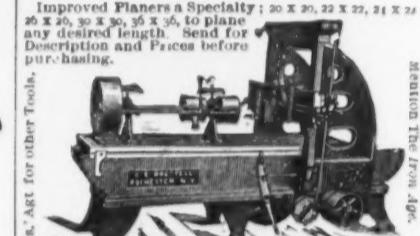
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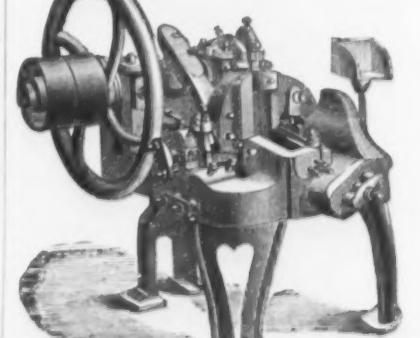
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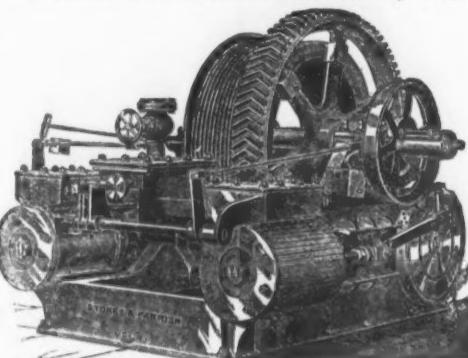
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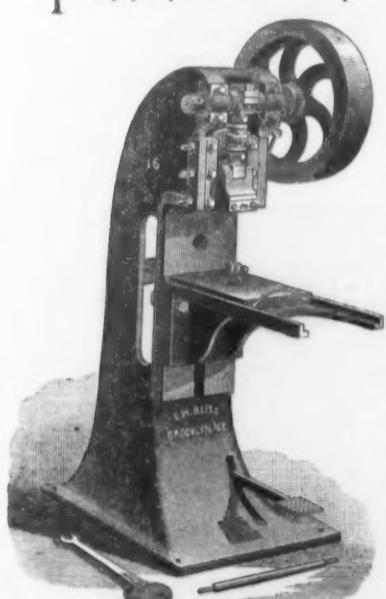
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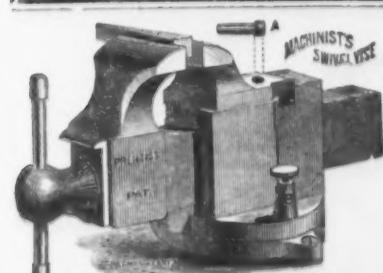
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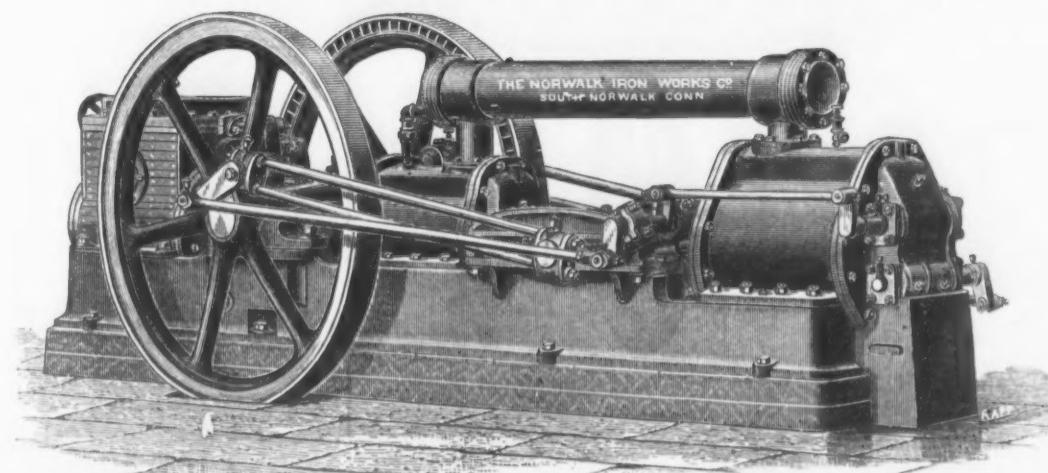
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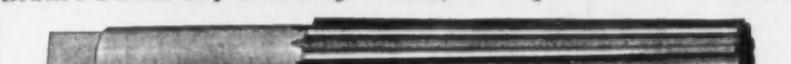
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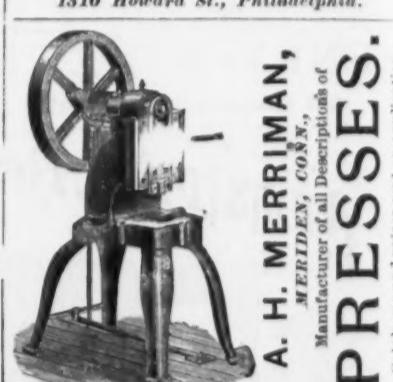
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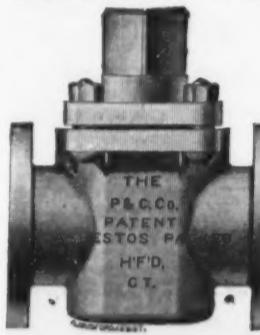
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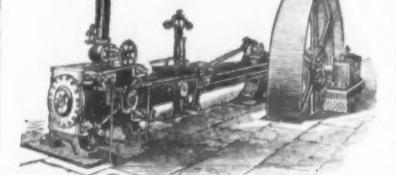
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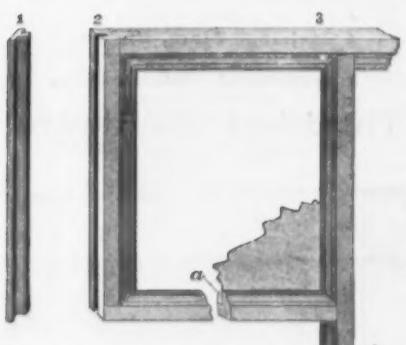
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